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NOTES FOR THE MONTH.

Sir Arthur Boscawen's Farewell Address to Farmers.

SPEAKING at the National Farmers' Union Dinner on Wednesday, 18th October, Sir Arthur Boscawen said that, as they well knew, there was a very serious crisis in political affairs, the result of which nobody could foresee, but there might be changes in the Government or a complete change of Government in the near future. This might, therefore, be the last occasion on which he should address a meeting of the National Farmers' Union as Minister of Agriculture. In saying that, he would like to add that his relations with the National Farmers' Union had always been most cordial and they had reposed in him confidence in a most generous way. He should never forget their kindness and could assure them that in whatever capacity he might be in the future, he would always do his best to further the cause of agriculture, and especially of those who were actually engaged in the cultivation of the soil. The fact, however, that this might be the last occasion enabled him to speak more freely than otherwise he might have done.

Agriculture was certainly going through a critical time, and he had the deepest sympathy with all classes engaged in it, owners, farmers and labourers. Undoubtedly, at the present moment, in many departments the industry could not be made to pay, but he thought there was a good future for the dairy farmer and fair hopes for the live stock industry generally; he did not see, however, how arable farmers, especially corn growers, could carry on on anything like the present scale. The result of this would be, as Mr. Orwin had pointed out in *The Times*, that the country would revert to grass very rapidly, that there would be a great decrease in the rural population and much temporary unemployment and distress. It looked as if the future of British agriculture lay in large farms cultivated cheaply and with low production, interspersed with patches of land intensively cultivated for fruit and vegetables in certain

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favoured localities. What could be done to stop this? There were two remedies which would be effective, but neither of them he thought was politically practicable. One was a tariff and the other subsidies. He did not believe the country, which was predominantly urban, would stand either. They must recollect that the agricultural population was a small fraction of the total population of the country, and the great majority of the electors, of the House of Commons, and by consequence of the Government of the day, whatever party the Government belonged to, would be predominantly urban.

The fact was that the industry must work out its own salvation on an economic basis, and all that the Government could do or would do, was to assist by measures which he would only describe as palliatives. Personally, he advocated the following: First, a relief in the burden of rating where the farmer was unfairly assessed compared with other people, since he had to occupy such a very large amount of rateable property in order to earn his living. But they must not expect salvation from rating reform. He had seen the accounts of several farms where accounts had been most scientifically kept, and the rates only counted for about 3 per cent. of the total outgoings. In the next place, rating reform was very difficult because the urban ratepayers demanded relief also. In many of our great towns the rates were over 20s. in the pound, and it would be very difficult to deal with agricultural rates apart from the rating question generally, but they should press for a general revision of the rating system coupled with some special relief to agricultural land.

In the next place, he thought it would be possible that the Government should set up better credit facilities than existed for farmers to-day. A small committee had been appointed to investigate the possibility of establishing with Government assistance co-operative land banks for the purpose of making loans to land-owners for permanent improvements and also short-term loans to farmers to enable them to carry on their business. This was very necessary since the alteration in the system of banking in this country and the elimination of the country banker had made it difficult for farmers to obtain loans on reasonable terms without collateral security.

Then he thought that inquiry should be instituted into the question of railway rates in order to ascertain definitely whether preference was or was not given to produce coming from over-seas, and with a view to reducing the present rates.

But beyond all things, the question of distribution must be overhauled. He made no general charge against the middlemen that they were making excessive profits. When we saw that English wheat was selling to-day at little more than pre-war prices, while bread was costing little less than twice pre-war prices, there must be something radically wrong with our system of distribution. There were too many persons and too many interests interposed between the producer and the consumer. Here he thought the farmers had the remedy chiefly in their own hands, and the Government could do little. Co-operation appeared to be the solution. It was this difficulty between wholesale and retail prices that caused the chief trouble to-day. The farmer, unable to see how to make a profit, attempts to do so by cheapening the cost of production, and the only item where he can secure a reduction worth mentioning is labour, which accounts for nearly 50 per cent. of his costs. But the labourer, owing to high retail prices, can scarcely live on a wage less than he is getting now. There is the difficulty. The farmer says: "I cannot pay more than 25s. a week," and the labourer says: "I cannot live on less than 30s."—both appeal to the Government. The Government is powerless to act, except by giving a subsidy which would in effect be a subsidy to wages. We should be getting back to the system of the old Poor Laws, when wages were directly subsidized by the ratepayer, a system which was condemned by all parties and was thoroughly unsound. He had seriously thought of trying to reintroduce a subsidy on arable land as a temporary expedient for one year, provided that the farmers continued to employ as many men as now and to pay not less than the present wages. His idea was to tide over an acute crisis, but he did not think that the plan was possible. Other industries, for example, the mining industry, which was suffering seriously to-day, would claim the same assistance, and we should not be sure that the experiment once made would not have to be repeated next year.

All this he knew was but cold comfort, but they must fight on and make the best of the situation. He did not believe the depression would last. He believed the present distress was due to temporary causes, the first being the thoroughly uneconomic methods we employed during the War, and the second, the collapse of foreign exchanges, which made this country the dumping ground for the superfluous products of the whole world. These causes would gradually disappear, and he thought a period of high prices was not very far distant. In the meantime,

however, he feared that some farmers would go under and that there would be much unemployment and distress among the labourers, but he could honestly say that he had not failed to bring the position in all its gravity before his colleagues.

As a member of the Government he would add one word. It was not true that the present Government had neglected agriculture. Only this year we had altered the assessment for income tax in the interest of the farmer, which he knew brought substantial relief in many cases, and we had remitted the duty on home-grown sugar in order to stimulate a new and valuable industry. Then, we were spending very large sums on agricultural education and research, which had in the past, and would still more in the future, help to reduce the cost of production. These were sound lines to proceed upon, and he did not know what more could be done at the present, except in the direction of those reforms to which he had alluded.

One word in conclusion. He had pointed out that agriculturists in this country were in a minority; then by all means let them stand together. The interests of owner, farmer and labourer were identical, yet too often we found them pulling against each other. There was, however, certainly a tendency to come together now, which was largely due to the action of the National Farmers' Union. Unless they all stood together, they would not have much chance of making their voices heard, and he would advise: keep agricultural policy and party politics quite apart. The National Farmers' Union did this, and he could fairly say that while he had been Minister, he had never approached agricultural questions from a party point of view. With regard to the labourers, it was a matter for regret that their Unions were tied to one political party. He did not say this out of any disrespect for the leaders of the Unions, for many of whom he had great respect, but it could not be good that the interests of agricultural labour should be identified with a political party.

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Importation of Canadian Store Cattle.

In consequence of the resolutions adopted by the House of Commons on 24th July and by the House of Lords on 26th July, a Conference was held at the Colonial Office on 14th October between representatives of H.M. Government and of the Canadian Government to discuss the admission of Canadian cattle. Mr. Churchill presided, and in addition there were present Sir Arthur G. Boscawen, Minister of Agri-

culture and Fisheries; the Hon. W. S. Fielding, Minister of Finance, Canada; the Hon. E. Lapointe, Minister of Marine, Canada; the Hon. P. C. Larkin, High Commissioner for Canada in London; and representatives of the Ministry of Agriculture and Fisheries, the Scottish Office, the Board of Agriculture for Scotland, and the Canadian Department of Agriculture.

A general discussion on principles having taken place, certain technical questions were remitted to a committee of experts representing both countries.

Further meetings of the Conference were held on the 18th and 20th October, Sir Arthur G. Boscawen presiding, in the absence of Mr. Churchill through illness. The conclusions of the committee of experts were considered and the Conference agreed upon the main conditions which should govern the importation of Canadian cattle into Great Britain, and these terms will be submitted to the new Government with a view to the introduction of the necessary Bill when Parliament next meets.

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Clean Milk Production.

THE demand for clean milk is increasing. Great efforts are being made to educate the public to appreciate clean milk and to call for its supply.

Quite apart from the fact that the production of milk in a cleanly manner brings its own reward by causing the milk to keep sweet longer and hence avoiding loss by souring, the indications are that, in future, clean fresh milk will command the most satisfactory market.

The section of the Milk and Dairies (Amendment) Act, 1922, which refers to grading, is due to come into operation on 1st January next. From that time more attention to the production of milk of a definite grade is a matter deserving of the attention of every dairy farmer.

The regulations applying to the different grades will be embodied in an Order to be issued by the Ministry of Health. When the Act was passed, it was contemplated that, apart from ordinary milk, there would be two main grades, namely, "Certified," and "Grade A," but a provision was embodied empowering the Minister of Health to establish additional grades. The grade "Certified" will be what has hitherto been known as "Grade A (Certified)." It is milk of the highest purity, produced only from cows which have passed the tuberculin test It must be bottled on the farm, and at any time before it reaches the consumer it must not contain more than 30,000 bacteria per

cubic centimetre. In addition it is necessary to comply with certain specified conditions as judged by inspection. It follows therefore that the production of "Certified" milk is a specialised business, and that such milk must be sold at an enhanced price to meet additional costs in production and distribution. It is not expected that this grade will monopolise the market, but the demand for it is steadily growing, and for those who are prepared to lay out capital in establishing a herd which passes the tuberculin test, in providing the necessary equipment, and who will take the trouble to train their employees, it does offer economic possibilities.

"Grade A" will, as at present suggested, be divided into two sections, namely, "Grade A, Raw," and "Grade A, Pasteurised." The herds producing milk of this grade (both sections) are not to be required to pass the tuberculin test, but they will be required to pass a physical inspection made by an approved veterinary surgeon. In the case of "Grade A, Raw" milk the only other requirement which need be mentioned is that it must not at any time before it reaches the consumer contain more than the number of bacteria which will be specified in the Order. To qualify for a licence to sell "Grade A, Pasteurised" milk the act of pasteurising must be performed in accordance with a prescribed method, and the milk so treated must afterwards comply, in respect of the number of bacteria contained, with a much lower count than in the case of "Grade A, Raw" milk. Generally speaking it is not expected that the ordinary farmer will be able to produce and sell, directly, "Grade A, Pasteurised" milk. His part will be to supply "Grade A. Raw" milk either for direct consumption or to a wholesale dealer or co-operative society who will carry out the work of pasteurisation.

It is likely that in course of time there will be a considerable demand for Grade A milk. No farmer need be afraid of the conditions with which it will be necessary to comply in order to obtain a Grade A certificate. There will be nothing in them that any producer cannot meet provided he and his employees will take the trouble to study and adopt the most approved methods of guarding against contamination, and that he will cool his milk well. What is wanted is an intelligent appreciation, by employer and employed, of the things that matter, and a determination to carry them out.

The Ministry has had experience of the useful work which can be done by County Instructors in helping farmers and farm

workers to master the art of clean milk production. It has been found that such assistance is effectively rendered by holding practical demonstrations on the farm followed by such lectures as may be necessary to explain the why and wherefore of the precautionary measures adopted, and by the organising of clean milk competitions. Because of this experience, and because it is expected that the farmers' need for such assistance will be greater in the future than it has been in the past the Ministry has recently addressed a letter on the subject to all County Education Authorities in England and Wales (see p. 764).

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Fluctuations in Live Weight.

THE articles by Mr. E. S. Beaven which recently appeared in the *Journal* on the subject of variety trials of cereals, point very emphatically to the need for greater care and accuracy in carrying out agricultural experiments of one description. That equal care is needed in relation to another description of experiments—feeding trials with cattle—may also be emphasised.

For example, in the *Agricultural Journal of India* for May of the present year, there appears an article entitled "Normal Fluctuations in Body Weight of Bovines." It deals with a subject which is of great importance to all experimenters undertaking feeding experiments with cattle. In carrying out such trials it is sometimes the practice to record only initial and final weights of animals under experiment. In determining these weights it is generally considered sufficient to ascertain the fasted live weight on one or two succeeding days at the beginning and close of the experiment. In the case of the experiments under notice, however, daily weighings were made of a number of animals (buffaloes) for a period of 88 days. Charts are published showing the daily variation of two animals, one set of a "control" and the other of an animal receiving a fattening ration. These charts show the most surprising changes from day to day. For example, we have such figures as the following on successive days:—324, 329, 342, 336, 332, 329, 335 and (eleven days after) 305, 310, 320, 315 lb. Similar results were obtained from a large number of animals. The principal conclusions arrived at are (1) that any conclusions as to the suitability of a ration or feeding stuff when based on data obtained from initial and final weighings, or weekly or fortnightly weighings, are practically valueless, (2) that weights should be taken daily, and conclusions based on the averages of weighings of groups of at least ten successive days.

It is improbable that the fluctuations observed were due to conditions peculiar to India. The author quotes an American experiment (Armsby, *The Nutrition of Farm Animals*, 1917) which points to the same conclusions, and in which daily fluctuations in the weight of a mature steer up to 5 per cent. of the body weight were observed. Many American investigators now take averages over ten successive days, in carrying out experiments involving the live weights of cattle.

Then, in this country, variations of the same order were recently observed in the course of certain experiments on the nutrition of cows carried out at Leeds University by Crowther and Woodman. Fluctuations in the weights of cows up to 43 lb. on two successive days were observed.

Facts of this description show how necessary it is under modern conditions to secure greater accuracy than has been observed in the past in experimental work with animals. The sources of error in feeding trials may be even greater than those with which Mr. Beaven's trenchant articles were concerned, for not only is the weight of one animal subject to considerable fluctuations but the variation from animal to animal is very large.

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Village History.

OF the value of local history no one now needs to be convinced. Its inspiration serves not only to preserve what is best in the past, but to assure a higher standard of living in the present. More of us than ever now know those little towns of Flanders where the unlovely creations of the eighteenth and nineteenth centuries are replaced, sometimes, perhaps, with a too conscious archaism, by worthier memorials of the genius of the country, and where it is hard to escape Flemish pottery, Flemish lace, Flemish silverwork, Flemish beer. Even if the emphasis is a little overdone, if there is too much stage furniture designed to please the eye of the visitor, yet commercialism at its worst cannot undo the good that lies in building houses which really do express something of the spirit of the people, and in making wares which are known for what they are without the aid of an inscription.

Mr. Guy Ewing, whose account of an interesting experiment appeared in the October issue of this *Journal*, makes an effective plea for the practical study of village history. He has worked single-handed, but lest others who are not equipped as he is for the task should hesitate to follow his example, it is not out of place to remind them that assistance may be had

from several quarters. The Historical Association (22, Russell Square, W.C.) is now a large body with branches all over the country: one of its aims is to foster the study of local history, and the co-operation of a neighbouring branch is almost certain to be forthcoming. Archæological societies exist in many counties, and the officers and members are always willing to give advice and help in exploring the history of a village and in the discovery of its antiquities. Much can be done, even without such help, by anyone who will study such books as Dr. Charles Cox's "How to write the History of a Parish," the Victoria County Histories and the few other county histories that rank with them, the publications of local archæological societies, and Dr. Hubert Hall's "Directory of British Archives" and his "List of Agrarian Surveys." With the aid of these books one may learn to know at least what documents to look for and where to look for them. Guidance in the search of antiquities which are not documentary is not so readily available, but Mr. and Mrs. Quinnell's "History of Everyday Things" should at least prove suggestive. A flair for recognising those things which will best illustrate the past is as desirable as knowledge: and, unfortunately, there is no recipe for acquiring a flair. But it is to be supposed that no one would undertake the task of studying or demonstrating village history on practical lines who did not possess a rudimentary flair, which practice and enthusiasm would develop.

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Lectures on Agricultural Research.

THE MINISTRY endeavours in many ways to bring before farmers the results of agricultural research—by its advisory scheme, in which college and county staffs play their part; by leaflets and articles in this *Journal;* and by miscellaneous publications such as the recently-issued volume on "Agricultural Research and the Farmer." It is now proposed to bring research workers more directly into touch with the farmer, and arrangements have been made with the National Farmers' Union to organise meetings which will be addressed by specialists in the various branches of agricultural science. The scheme is certainly an experiment, but if it proves to be as successful as is anticipated this winter, it may well obtain a permanent place in the organisation of the work of the Ministry. A list of meetings, with the dates which have so far been definitely fixed, is given below. Any inquiries with regard

to the arrangements should be addressed to the Secretary of the Branch of the National Farmers' Union concerned.

Branch of the National Farmers' Union	*Subject Chosen*	*Lecturer*	*Institute*	*Date of Lecture*
Beds and Hunts	The General Cropping of Arable Land	Mr. A. Amos	School of Agriculture, Cambridge	December 16th
Bucks	Milk Production and Dairying	Mr. J. Macintosh	National Institute for Research in Dairying	November 15th
Cheshire ...	Soil Research	Sir John Russell	Rothamsted Experimental Station	
Gloucester ...	Agricultural Rating	Mr. C. S. Orwin	Institute for Research in Agricultural Economics	November 11th
Lincs	Wheat	Prof. R. H. Biffen	Plant Breeding Research Institute, Cambridge University	
Lincs (Holland)	Pests affecting mustard, turnip seed and peas	Prof. F. V. Theobald	Research and Advisory Dept., South Eastern Agricultural College, Wye, Kent	—
Northants ...	Insect Pests	Dr. A. D. Imms	Rothamsted Experimental Station	January 27th
Oxford	Insect Pests	Prof. F. V. Theobald	Research and Advisory Dept., South Eastern Agricultural College, Wye	January 10th
Pembroke ...	Silage	Mr. J. F. Blackshaw	Ministry of Agriculture	
Salop	Parasitic attacks on Cereals and Diseases of Tubers	Dr. W. B. Brierley	Rothamsted Experimental Station	November 14th
Sussex. E. ...	Digestibility of Feeding Stuffs	Prof. T. B. Wood	Animal Nutrition Research Institute, Cambridge University	—
N.R. Yorks ...	Plant Breeding	Prof. R. H. Biffen	Plant Breeding Research Institute, Cambridge University	—
W.R. Yorks, Doncaster	Wireworm	Dr. A. D. Imms	Rothamsted Experimental Station	—
W.R. Yorks, Leeds	Economy in Production of Winter Milk by Growing Fodder Crops	Mr. J. Mackintosh	National Institute for Research in Dairying	November 3rd

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Conciliation Committees in Agriculture.

DURING the past month the Cumberland and Westmorland Committee, whose current agreement is due to expire at Martinmas, has reached a further agreement for the following six monthly hiring period, the terms being as follows :—

I.—Skilled Workers.

Workers aged.		
21 and over	37/- per week of customary hours	Customary hours are 63 per week.
20 & under 21 ...	32/- " " " " "	
18 to 20	28/- " " " " "	
16 " 18	23/- " " " " "	

II.—Other Male Workers.

21 & over 30/- per week of 54 hours in summer and 48 hours in winter.

III.—Female Workers.

16 & over 5d. per hour.

The precise period of operation of this agreement is from 11th November, 1922, to 19th May, 1923.

The Cornwall Committee has reached an agreement operating over the period from 23rd October to 31st December. The terms provide for the payment of efficient adult male agricultural labourers at the rate of 30s. for a week of 52 hours, and it is understood that the Committee have under consideration the question of the registration of the agreement.

The Committee for Ashby Bosworth, Hinckley and Atherstone areas has reached an agreement for the payment of 31s. 6d. for a week of 54 hours. The question of overtime rates has been deferred to a later date. In addition, the Cheshire, Staffordshire and Worcestershire Committees agreed to extend their last agreements up to 14th, 31st and 28th October respectively.

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The Agricultural Index Number.

A FURTHER fall is recorded in the index number of prices of agricultural produce in England and Wales during September, the average increase compared with the corresponding month in the years 1911 to 1913 being 57 per cent. in September against 67 per cent. in August.

In the following table are shown the increases in each month since the beginning of 1921, the corresponding month in 1911 to 1913 being taken as the basis of comparison in each case :—

Month.	Percentage Increase in Prices. 1921	1922	Month.	Percentage Increase in Prices. 1921	1922
January ...	183	75	July ...	112	72
February	167	79	August ...	131	67
March ...	150	77	September	116	57
April ...	149	70	October ...	86	
May ...	119	71	November	79	
June ...	112	68	December	76	

Nearly all descriptions of produce shared in the reduction, the only increase being in the case of eggs. Wheat, barley and oats all fell heavily, and the average prices during September were only from 23 to 31 per cent. higher than in the corresponding month of 1911 to 1913.

Potatoes were also cheaper and during September were at practically pre-war level, while a slight reduction occurred in the case of hay.

All descriptions of live stock experienced a fall, pigs being least affected. Milk was unchanged in price, but cheese and butter were relatively cheaper than in August, as compared with the corresponding months in 1911 to 1913. Prices of poultry remained practically unchanged, but eggs advanced sharply, decidedly more so than was customary between August and September before the War.

The reduction in the general index number of all produce was materially assisted by a further reduction in the prices of fruit and vegetables, the former averaging about 16 per cent. below and vegetables 20 per cent. above the prices ruling in September before the War.

The following table shows the average increase during recent months in the value of the principal commodities sold by the farmer:—

PERCENTAGE INCREASE AS COMPARED WITH THE AVERAGE PRICES RULING IN THE CORRESPONDING MONTHS OF 1911-13.

	April.	May.	June.	July.	Aug.	Sept.
Wheat ...	57	62	60	53	53	23
Barley ...	49	49	58	49	48	26
Oats	49	53	57	55	59	31
Fat cattle ...	65	70	71	70	70	58
Fat sheep ...	128	140	121	107	103	90
Fat pigs ..	90	91	82	91	92	84
Eggs ...	89	50	69	80	64	96
Poultry ...	83	110	116	103	85	85
Milk	42	27	28	53	70	70
Butter ...	49	54	59	79	77	76
Cheese ...	46	48	55	50	51	41
Potatoes ...	95	140	80	75	14	1
Hay	28	33	35	37	54	52

THE POSSIBILITY OF USING TOWN REFUSE AS MANURE.

SIR JOHN RUSSELL, D.Sc., F.R.S.,
Rothamsted Experimental Station.

IN recent years the shortage of town stable manure has compelled farmers who used to rely on this material to cast about for substitutes. Among the various possibilities is to be reckoned ashpit refuse, which is available in large quantities but is at present used to a very limited extent. Most of us have seen and smelt the huge refuse dumps that have grown up round London, and if the fertiliser value could be assessed by the disagreeable odour the case for town refuse would be sufficiently convincing. As might be expected, there is an increasing reluctance on the part of country people to allow the countryside to be disfigured in this way. A less objectional method than that of dumping in country districts is to incinerate the refuse, but this is costly, and of course is sheer waste. More up-to-date town authorities are now making an effort to dispose of their refuse in a better and more useful way, and some are adding other wastes and crushing the whole for use as a fertiliser.

Present Use as Manure.—It is not easy to arrive at any clear estimate of the fertiliser value of so mixed a material as town refuse. Analysis alone does not afford sufficient information, and field trials, which constitute the only reliable means, are very slow.

There is, however, a certain body of experience on the part of farmers who have used town refuse on which one may usefully draw for guidance. Broadly speaking, town refuse has given successful results in two cases:—

(*a*) On heavy-land farms or allotments, where it is used for root crops, cabbages, etc.;

(*b*) For raising the level of low-lying wet ground and forming new land which can be used for allotments.

Considerable quantities of town refuse have been used by farmers on the heavy London Clay soils of the Home Counties. About 10 tons per acre is a usual dressing: it should be spread before the winter ploughing begins so that it can be well worked into the soil. It then lightens the stiff soil and facilitates cultivation generally, and good root and other crops are usually

obtained. Farmers round some of the larger Scottish towns, *e.g.*, Glasgow, Dundee, Perth, and Aberdeen, use considerable amounts, probably even more than those round London. Uncrushed refuse is sold from Dundee, where the demand is stated to be greater than the supply: the 1921 deliveries are said to have been 89,000 tons. An important factor that greatly helps the consumption of this material in Scotland is that very favourable railway rates are in operation. In England the railway rates, generally speaking, are much higher than those for stable manure, and so it comes about that up to the present experience of this material is in the main limited to farmers on heavy land in the immediate vicinity of towns.

The amounts of ashpit refuse available over the country are very large. It is estimated that no fewer than 10,000,000 tons per annum are produced in England and Wales, while in London alone the production is estimated at 1,500,000 tons per annum. The towns might afford to spend some money on converting the material into fertiliser since at the present time they spend something like £6,000,000 per annum on collection and disposal.

Types and Composition of Refuse.—There are four types of refuse sent out from towns:—

1. "Dry refuse": the contents of ashpits.
2. Night soil: produced in towns where the pail system is used. It is dried and granulated and contains some 5½ per cent. nitrogen, 5½ per cent. phosphates and 2½ per cent. potash.
3. "Mixed refuse," *i.e.*, dry refuse *plus* night soil mixed in certain proportions. A 50 per cent. mixture offered at Rochdale contains 2.9 per cent. nitrogen, 3.6 per cent. phosphates (half being soluble and half insoluble) and 1.2 per cent. potash.
4. Street sweepings and other wastes.

Of these the street sweepings and the unmixed night soils are well known to farmers and are often easily disposed of. One of the large London districts disposes of its street sweepings at 10s. per ton on the barge. Night soil in the dry form, unmixed with ashes, is now sold by the Rochdale, Warrington and probably other corporations at a figure of about £7 per ton. If the methods used in these places were generally applicable to town and city conditions the problems arising out of the waste of sewage would be solved and the shortage of organic manures

on the farm would be greatly relieved; but we must expect these methods of conservancy to be superseded, and therefore we must turn to ashpit refuse as the only important unfailing source of this type of material.

In its crude form the refuse contains a small percentage of cans, bottles, etc., of no use on the farm but indeed constituting a nuisance. In the more progressive towns these are removed and the material undergoes a certain amount of sorting to remove coal, cinders, rags, bones, scrap metal, etc., for all of which a market can be found. Thus at Falkirk, where a good modern plant has been installed, the cinder amounts to some 35 per cent. of the total collection: it has a calorific value of 8,000 B.T.U. per lb., and after being taken out is used for steam raising at the local electricity station. Whatever the preliminary sorting treatment the remaining material is disintegrated to break up the larger and coarser materials. Three possibilities are then open:—

1. *Use without Modification.*—The material can be offered to farmers as it stands. It is in good physical condition for putting on to the ground and for lightening a heavy soil. Its composition, however, is not particularly good in spite of its smell. Improvement is effected by enriching with a certain amount of other waste matter, such as street sweepings, slaughterhouse refuse, stable manure, etc., and the final analysis comes out something like the following:—

Organic matter	25%—40%
Nitrogen...	0.4%—0.6%
Phosphoric acid (P_2O_5) ...	0.3%—0.5%
Equivalent to tricalcic phosphate ($Ca_3(PO_4)_2$)	0.7%—1.1%
Potash (K_2O)	0.3%—0.5%

It is sometimes the practice to compare these figures with those for stable manure, but as a matter of fact the two things are so completely different that no comparison on the basis of analytical data is possible. In the case of stable manure it is not difficult to arrive at some estimate of value from a careful study of the analytical data, as there is the possibility of ascertaining approximately what proportions of the various fertilising constituents have come from straw, fæces and urine, these being the three components. In the case of ashpit refuse it is impossible to say how much of the nitrogen comes from animal or vegetable refuse (where it would have a certain value),

TABLE I.—COMPOSITION OF ASHPIT REFUSE AS PREPARED BY CERTAIN TOWNS.

(Bottles and tins are removed, other wastes are usually added, and the material is crushed.)

	Gosforth	Bury	Sheffield			Falkirk		Southwark		Hove	Halifax†
			1	2	3	1	2*	1	2		
Moisture	25·0	34·4	2·84	2·89	2·77	...	11·20	30·74	28·98	...	40·8
Organic matter	23·1	13·6	28·6	34·2	37·5	...	20·51	32·04	26·96	...	21·7
Mineral matter	45·9	52·0	...	...	...	...	...	...	...	...	13·0
Nitrogen	0·50	0·55	0·7	0·57	0·67	0·39	0·56	1·21	0·70	0·56 to 0·84	2·13
Equivalent to ammonia... ...	0·60	0·67	0 86	0·70	0·82	0·47	0·68	1·46	0·86	0·68 „ 1·02	2·59
Phosphoric acid (P_2O_5)... ...	0·19	0·33	0·77	0·49	0·45	0·81	0·33	1·09	1·15	0·56 „ 0·82	0·56
Equivalent to Tribasic-phosphate of lime	0·41	0·72	1·68	1·07	0·98	1·76	0·72	2·37	2·52	1·22 „ 1·79	1·22
Potash (K_2O)	0·30	...	0·33	0·64	0·50	0·42	0·54	0·60	0·64	0·43 „ 0·60	...

* A full analysis was made of this sample and the following additional results were obtained :—

Silica	29·61	Sulphuric anhydride	0·95
Alumina	14·93	Soda	0·18
Oxide of iron	2·40	Combined water, carbonic acid, &c.	9·95
Lime	4·94	Potash soluble in water	traces
Magnesia	1·16		

† Mixture of night soil and prepared refuse. "Sand" is not counted in the mineral matter.

and how much from manurially worthless substances which may form a large part of the material. Something could be deduced if the organic matter (which of course includes much of the cinders) were divided in the analysis into easily combustible (vegetable and animal refuse), and not easily combustible material (cinders, etc.); but in no case can the analysis give very precise information.

It would be a mistake to underrate the fertiliser effect of the nitrogen, potash and phosphate in the material, but equally of course it would be inadvisable to put too high a value on them. So far as our present experience goes the chief value of the ash-pit refuse itself lies in its physical effect in lightening a heavy soil, and any manurial action it may have is to be attributed to any animal or vegetable refuse that may be present. The analysis does not easily show this, although a rough idea may be obtained from the nitrogen percentage. Inspection of samples delivered from London during the past season gave the impression that winter deliveries contained a larger percentage of cinders and a smaller percentage of fertilising animal and vegetable matter than the summer deliveries; hence probably the summer material would have rather a higher value to the farmer. The circumstance that much of the value of the refuse lies in its physical action makes it impossible to put any definite price on the refuse. It should of course be obtainable more cheaply than stable manure. On the other hand dressings of about 10 tons per acre have proved very useful on heavy land for root crops, cabbages, etc., and a farmer is really justified in spending a certain amount of money to obtain this result. If town stable manure costs about 12s. per ton on the farm it is probably not far wrong to say that town refuse would be worth, say, 6s. per ton on the farm, and more if the percentage of nitrogen rose above 0.6.

2. *Crushing.*—Some samples seen by the writer have been ground very finely. A certain amount of pulverisation is desirable, but it is not clear how far anything is gained by grinding too finely. The material of course is not like basic slag or mineral phosphate: it does not dissolve in the soil solution, and only the vegetable matter and the bones can gain in value by fine grinding. The actual ashes may even lose in value.

3. *Addition of Richer Material.*—In some of the northern towns it is found possible to add a considerable proportion of night soil in addition to street sweepings, cattle market manure, slaughterhouse refuse and stable manure. An excellent fertiliser

is thus obtained, containing one or more per cent. of nitrogen. One of the best illustrations in England is furnished by Gateshead, where the vigorously managed Cleansing Department is taking full advantage of the various available wastes. The Superintendent of this Department sends the following particulars of the fertiliser made by the town authorities from the refuse. The tins, bottles, glass, etc., are removed, stable manure, slaughterhouse refuse, earth-closet material are added, and the whole passed through a pulverising machine and broken up to pass through a $\frac{5}{8}$ grate. As 90 per cent. of the houses in Gateshead are of the old earth-closet type the house refuse contains a considerable proportion of human excretions. It is not surprising therefore that the manure finds a ready sale.

The material is offered at Gateshead at 2s. 6d. per ton. It is delivered in 5 tons lots, and on a farm 5 miles away, with the occupier of which the writer has discussed the matter fully, the price works out at 5s. 6d. per ton, the steam wagons taking the material where possible into the actual field which is to be treated. It has given good results on roots, and it improves the physical texture of the soil though it still remains to be seen whether the material lasts as well as farmyard manure. On the farm in question farmyard manure is estimated to cost 14s. per ton.

An actual test was made at Cockle Park in 1921 to compare town refuse with farmyard manure. Both were applied at the rate of 15 tons per acre to a swede crop: the Gateshead refuse gave 21½ tons of swedes to the acre, and the farmyard manure gave 25¼ tons. The season was dry and therefore more favourable to farmyard manure than to town refuse.

The enrichment of the refuse is shown by the fact that the nitrogen content runs as high as 1 per cent., whilst the samples of unfortified town refuse contain only about 0.5 per cent. It is understood that some 30,000-35,000 tons of the material were sold to farmers during the past season and that deliveries were effected as far south as Thirsk.

An even richer fertiliser is now being prepared at Halifax (Table I) where it is understood the Corporation are contemplating the erection of special mixing plant.

Another instance of successful enrichment is afforded by Dundee, where cattle market and slaughterhouse wastes and offals are incorporated with the refuse, and this circumstance, together with the favourable railway rate largely explains the high con-

sumption which the authorities of that city have managed to obtain among local farmers.

It has been proposed to add soot to the town refuse, but this would not be a sound procedure. During the War an enterprising person offered 100,000 tons of enriched town refuse free on rail at £3 per ton: the composition of the mixture was:—

Total nitrogen	1·22%	Potash (K_2O) ...	0·80%
Ammoniacal nitrogen	0·52%	Phosphoric acid (P_2O_5)	0·30%

This of course would have been a very dear fertiliser. The figures are quoted as showing how uniform the material is in composition: if we deduct the ammoniacal nitrogen (which is mainly soot) from the total we arrive at a composition which is very similar to the figures given in Table I, viz., nitrogen 0.7 per cent., phosphoric acid (P_2O_5) 0.3 per cent., potash (K_2O) 0.8 per cent.

These modern prepared wastes are well worth attention by farmers, and trial lots may usefully be put on the root and cabbage land, and possibly also used for hay on stiff clay soils. A test has been started at Rothamsted, and other experimental farms might consider the possibility of arranging for trials.

* * * * * *

THE CLYDESDALE.

A. MACNEILAGE.

THE Clydesdale is the Scottish breed of draught horses. Its name indicates its origin. Clydesdale is the old name for the county of Lanark, through which flows the river Clyde. The Clydesdale is the horse that was originally moulded into its established type and form by farmers holding land in the valley of the Clyde. Its fortunes, since the middle of the eighteenth century at least, have been identified with the Royal burgh of Lanark. There in the eighteenth and the earlier part of the nineteenth century annual fairs were held at which mobs of young colts and fillies were sold to dealers and drafted into England. Another old-time fair was held at Biggar, higher up the Clyde Valley, and there also was done a notable trade in young Clydesdales. Now for thirty years past in the town of Lanark, under modern conditions, most extensive auction sales of Clydesdales—mainly yearlings and two-year-olds—have been held. Lanark and Clydesdale are emphatically the home of the Scottish breed of draught horses.

How farmers in the area referred to first came to fix their

minds on breeding a heavy horse is not clear. There is reason to believe that a useful type of carrying horse had long been associated with the area and no doubt the advance in road-making, before the development of railway traffic, gradually led men to aim at producing a heavier horse better adapted for draught than for carrying. Tradition assigns influence in increasing weight to the use of one or two Flemish stallions by the sixth Duke of Hamilton (1742-1758), and by John Paterson, a farmer in Lochlyoch parish of Thankerton, about the years 1715-1720. John Paterson and his stallion are authentic, and the late Lawrence Drew—a noted man in his time, and a great horse-breeder—credited the ownership of one Flemish stallion to the sixth Duke of Hamilton.

At a later date—about the year 1780—a horse called Blaze, owned by Mr. Scott, a farmer in Carnwath, admittedly greatly improved the native breed. Mr. Scott was an ancestor of Mr. James Weir, Sandilands, Lanark, President of the Clydesdale Horse Society for the current year (1922-23). Blaze was purchased in Ayrshire but whence he came to Ayrshire is not clearly known. It was said by some that he came from England.

A notable breed of mares was owned by the family of Somerville, on Lampits farm in Carnwath parish, where there is a ford across Clyde. These Lampits mares were reputed to be of the Lochlyoch stock of John Paterson, and to one of them has been assigned a very powerful influence in the development of the modern Clydesdale. She was bought at a sale at Shotts Hill Mill in 1808. It may be doubted whether the links which bind the modern Clydesdale to this particular mare are quite as clearly established as the writer of the Introductory History to the Retrospective Volume of the Clydesdale Stud Book supposed—but her influence was great—and Glancer, *alias* Thompson's Black Horse 335, was unquestionably a well-known and much valued sire. What is clearly and incontrovertibly established is that the Clydesdale as bred in Aberdeenshire and the north, in Galloway in the south, in the Kintyre peninsula, in Ayrshire and Renfrewshire in the west, and in Cumberland in the north of England, is descended directly from Lanarkshire horses and mares purchased during the first quarter of the nineteenth century in the Upper Ward of Lanarkshire or Clydesdale. The links that bind these sections of the Clydesdale breed to the fountain-head are clearly defined and historically sure.

A very famous sire which flourished about the year 1840 was Clyde, *alias* Glaneer 153, known popularly as "Fulton's ruptured horse." An old farmer who remembered him well told the writer that he was a "mickle, strong horse." Seven stallions got by him are recorded and all of them were similarly impressive and prepotent sires. Their influence was widespread. Other notable fountain heads were Rob Roy 714, Old Clyde 574, Largs Jock 444, Old Farmer 576 and Pringle's Young Clyde 949. These can all be connected with Lanarkshire, but cannot be proved to have been connected with the Lampits mare, or the Lochlyoch race. In areas widely apart they left an indelible impression and were largely instrumental in making the Clydesdale the Scottish breed of draught horses.

Breeding Influences.—Two agencies exerted a powerful influence in developing the breed—the inauguration of competitive exhibitions by the Highland and Agricultural Society in the early twenties of last century; and the system of hiring stallions by district societies, of the existence of which there is evidence as early as 1832. By the former a standard of merit was set up and by the latter the best horses were distributed through the country. These two influences continue to be exerted to a surprising extent. At the beginning of 1919, 180 stallions had been hired for service in 1920, 76 had been hired for 1921, 10 had been hired for 1922 and 3 had been hired for 1923. With such a system of hiring generally in operation, it is not difficult to understand how one type of horse came to be developed through the whole Clydesdale area, which may be said in a general way to embrace the four northern counties of England and the whole of Scotland.

Standard and Type.—A very marked change has taken place in the type aimed at by breeders of Clydesdales. The general principles, which have never been departed from, are that wearing properties of feet and legs are of supreme importance in the draught horse, and that quality, by which is meant the capacity for wearing well, is of greater importance than mere weight avoirdupois. Experience has shown that the horse which wears longest may be and usually is the horse which takes the longest time to come to maturity. While these two general principles have never been departed from, a considerable modification of emphasis has taken place from time to time. The Clydesdale of the first quarter of the nineteenth century was a handsome well-built animal, with finely carried head and neck, high at the withers, with sound open hoof-

heads, but not carrying much hair on the legs and altogether minus the modern "spat" as it is called—the fringe of hair spread over the hoof-heads—and giving the impression of great obliqueness of pastern joint and fetlock.

During the dominance of the "Ruptured Horse" (153) and his seven sons—a heavier, more massive, and more lorry-like type was fancied and bred. The soundness of the feet and the open hoof-head were insisted on, but there was more hair on the legs, the obliqueness of the pasterns was not so much insisted on, and on the whole the horse fancied was decidedly a "big" horse.

In the early sixties came the demand for better action and greater gaiety of carriage and movement. The dominant influence in creating this demand was Sir Walter Scott 797 which won supreme honours at the Royal International Show at Battersea in 1862. This type and the demand for style and action continued to maintain an ascendancy all through the long career of Prince of Wales 673 (1866-1888), a grandson of Sir Walter Scott 797.

In 1872 one of the greatest sires the breed has ever known, Darnley 222 (1872-1886), was foaled at Keir. His dam and the dam of Prince of Wales 673 were both celebrated showyard mares, and both were by Samson 741, one of the most impressive of Clydesdale sires. The produce of Prince of Wales 673 and Darnley 222 blended well, in so far as producing showyard winners is concerned, but a general lack of size and weight was noticeable. The orthodox blend was Prince of Wales and a Darnley filly, and for many a day Prince of Albion 6178, bred on these lines, held the record, having been sold when a two-year-old stallion for £3,000. Another, Prince Alexander 8899, bred on similar lines, held the record for a foal, having been sold for £1,200. He was champion at the Highland and Agricultural Society's Show at Dundee, in 1890, when a yearling colt, beating amongst others Prince of Albion 6178. What this blend demonstrated was the incomparable merit of daughters of Darnley 222 as dams of prize stock.

Yet something almost akin to accident demonstrated that the influence of Darnley was to be much greater through his sons. This was seen when his grandson Sir Everard 5353 appeared. His sire was Top Gallant 1850 (1877-1886) a big son of Darnley with incomparable feet, and his dam was by a son of Prince of Wales 673. Sir Everard proved a most valuable sire. He was himself a weighty, big horse, and exhibited the balance of

quality and weight which was in risk of being lost when the Prince of Wales-Darnley cross was in the ascendant. Since the days of Sir Everard 5353 (1885-1898) his race has dominated the breed. He sired Baron's Pride 9122 (1890-1912) the soundest and best wearing sire the breed has produced. His feet and limbs were perfect in respect of wearing qualities. His limbs in the last years of his life were as "sweet" and clean and the bone as sharply defined as when he was champion at the Highland and Agricultural Society's Show at Aberdeen, in 1894. The Clydesdale breed in so far as the showyard is concerned is dominated by the influence of Baron's Pride. His grandson Dunure Footprint 15203 is the most prolific known sire of the breed. His service fees for several seasons have been £60 payable at service, and £60 additional for every mare left in foal.

On the Prince of Wales 673 side the most outstanding modern sire has easily been Hiawatha 10067 (1892-1915). He was got by Prince Robert 7135, a son of Prince of Wales 673, and bears the record of being the most successful show horse of the breed. His daughters mated very successfully with Baron's Pride 9122 and Baron's Pride's daughters mated very successfully with Hiawatha 10067, but while Baron's Pride was the ideal typical Clydesdale with faultless feet and limbs and well ribbed, with a beautifully set head and neck and high withers, albeit rather light in the thighs and lacking muscular development there, Hiawatha 10067 set a new type in Clydesdales. He was himself a "tall" horse. He came very slowly to maturity and always appeared a little "leggy." He had perfectly formed hind limbs and bones which looked like ivory. No one of the older race of Clydesdale fanciers or owners, that is the men of about 1850-1900 ever thought of speaking of a "tall" horse; their ideal was ever the "thick" horse—big when lying down. Hiawatha made the "tall" horse popular, and to-day a slowly-maturing colt with broad, flat, thin, clean bones is not found fault with, even should he be a little "on the leg." Granted he is out of the short-legged, deep-ribbed, sound-footed and sound-limbed type of mare, he is more favoured by judges than the short-legged thick colt which is pronounced "old fashioned."

Popularity of the Breed.—The Clydesdale has for well nigh a century been in demand for export. Hence his prominence especially in Australia, New Zealand and Canada. During the years from 1850 to about 1880 a fair number of the best

stallions and mares were annually shipped to those countries. In 1880 a big trade in second-class animals began with the United States and lasted for about a dozen years. It was an unfortunate trade, as too many animals of secondary merit were shipped. During the years immediately preceding 1914 there was an extraordinary export trade which reached high-water mark in 1911, when the number of export certificates issued by the Breed Society was 1,617. Since the War exports have been few in number, but have included some of the best stallions and mares of their years, including Cawdor Cup Champion winners.

The Clydesdale holds the record among draught breeds for high prices realised at public auction. Baron of Buchlyvie 11263 was sold in this way in Ayr market in December, 1911, for £9,500; in October, 1915, his son Bonnie Buchlyvie 14087 was sold at the Seaham dispersion for 5,000 guineas; the brood mare Dunure Glad Eye 39839 was sold at Dene House dispersion sale in April, 1919, for 1,850 guineas; at the Lanark sales in October, 1920, the yearling colt Record 20157 was sold for £3,400. The following are some of the outstanding averages realised at auction sales during the better part of the past half century :—

Date.	*Place.*	*Number.*	*Average Price.*
20th October, 1876	Knockdon - - - - - -	22 head	£209 15 2
11th October, 1906	Blacon Point (dispersion) -	14 females	£206 10 6
7th October, 1915	Seaham Harbour (dispersion)	100 head (both sexes and all ages)	£211 17 4
6th March, 1917	Dunure Mains (draft) - -	47 head	£323 18 8
5th March, 1918	Banks Stud (dispersion) -	25 stallions	£557 19 5
14th January, 1919	Dunure Mains (dispersion) -	13 stallions	£1,676 7 4
8th October, 1920	Boquhan (dispersion) - -	40 (mostly females)	£317 8 3
11th October, 1920	Dunure Mains (dispersion) -	28 head	£1,312 2 1
13th October, 1920	Farleton (dispersion) - -	19 (mostly females)	£408 13 8

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LABOUR ON THE FARM.

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SINCE the year 1908 a large amount of statistical data bearing on the various aspects of farm costs has been accumulated in the Department of Agriculture of the University of Leeds, and a systematic investigation of the records may be interesting and instructive. More or less complete records on at least eight farms can be traced back continuously to 1912, while at the present time 52 Yorkshire farms of varied size and type are being costed through the Department.

During the past year the bill for manual labour has been found to vary on the different farms from £1 8s. 6d. to £17 2s. 4d. per acre. Such wide limits naturally lead one to ask what are the varying factors which have contributed to bring about such widely varying labour costs in the same year? Was the one farm being farmed efficiently? Was the management justified by results in so large an outlay on manual labour on the other farm? How much per acre ought a farmer at the present time to be spending on labour?

During the time that the investigations have been carried out, the labour bill on one small holding of 16 acres has been found to increase from £52 in the year ending 31st December, 1912, to £289 18s. 1d. for the year ending 31st December, 1921. Was labour in pre-war days, or in the early days of the War, before the institution of the Agricultural Wages Board, getting its fair share of the output from the farm? Have the awards of the Wages Board, and the subsequent recommendations of the Conciliation Committees with regard to labour, been reasonable and fair, or is labour at the present time getting an undue share of the net returns from the farms? The records available can suggest answers to practically all of these questions.

Influence of the War on the Labour Bill.—In Table I are shown the yearly variations in the labour bills of 4 different types of Yorkshire farms, these variations being typical of those found on the other farms of which available records date back to pre-war days. It will be seen that with the outbreak of the War and the subsequent rise in prices the wages bills on the farms remained with very few exceptions fairly stationary until in

1917-18 the institution of the Wages Board and the successive Wages Board Orders tended to raise them higher and higher. In each case the maximum was reached in the year 1920-21, and with the disappearance of the Wages Board, and the subsequent advent of the Conciliation Committees, there has been a slight drop, though the wages bill in 1921-22 in no case met with by the authors fell to the level of the year 1919-20.

TABLE I.

ANNUAL VARIATIONS IN THE LABOUR BILL OF 4 YORKSHIRE FARMS.

Year	H. £	C.M. £	D. £	M. £
1911-12	52	786	324	965
1912-13	74	796	355	972
1913-14	83	829	417	971
1914-15	77	825	584	911
1915-16	98	808	570	1,153
1916-17	99	758	604	1,274
1917-18	102	834	664	1,694
1918-19	224	1,336	692	1,755
1919-20	279	1,650	991	2,292
1920-21	309	2,118	1,254	2,632
1921-22	290	1,841	1,107	2,487

In Fig. 1 the annual variations of the labour bills of these farms are plotted for the sake of comparison on an acreage basis.

FARM H. is a small holding of 16 acres, on the outskirts of an industrial town, and is given up entirely to milk production.

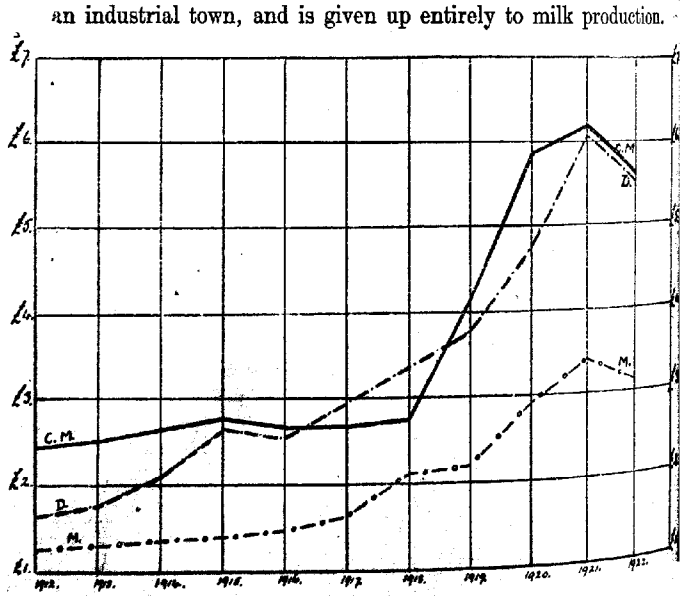


FIG. 1.—Annual Variations in Labour Bill per acre.

C.M. is a mixed farm of just over 800 acres, specialises in pigs, but breeds and rears cattle and produces milk, the milk being mainly converted into butter and cheese. Some of the land is good potato land, though good corn crops, particularly wheat, can be grown.

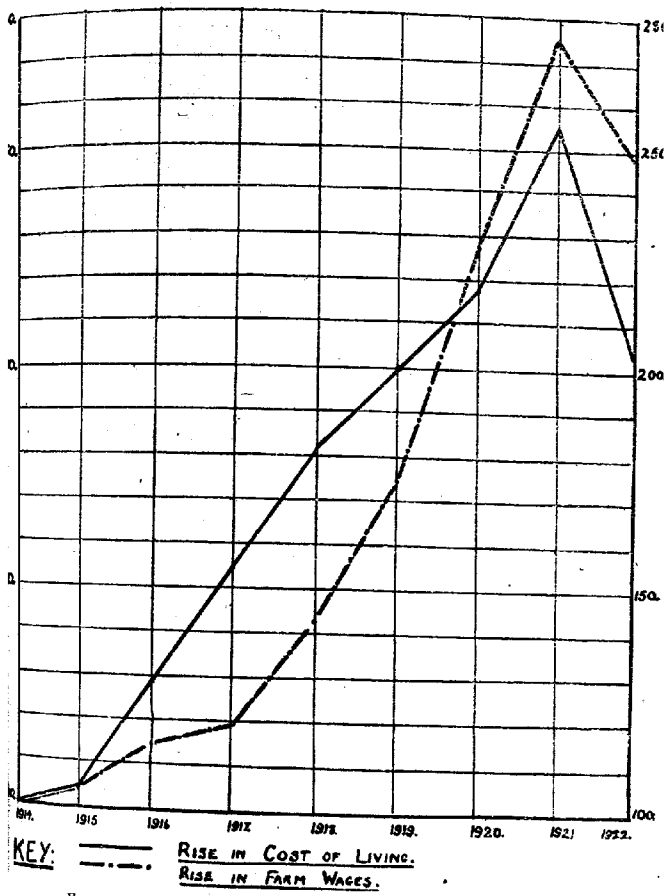


FIG. 2.—Correlation of Rise of Farm Wages with Cost of Living.

D. is a mixed farm of just over 200 acres, which started to develop the milk industry at the outbreak of the War. It could be looked upon as barley rather than wheat land.

M. is a farm of 786 acres, two-thirds of which is grass, mainly sheep land, the arable land being light and given up largely to potatoes and rye.

As far as Yorkshire as a whole is concerned, the Wages Board awards may be briefly summarised as follows:—

Date of Award	For	Minimum wage per week	Hours Summer	Hours Winter
12th Sept., 1918	Adult Labourer	35s.	54	51
21st Oct., 1918	Stockmen	41s.	Customary Hours.	
6th Oct., 1919	Adult Labourer	41s.	50	48
19th April, 1920	All Classes	45s.	50	48
23rd Oct., 1920	„ „	49s.	50	48

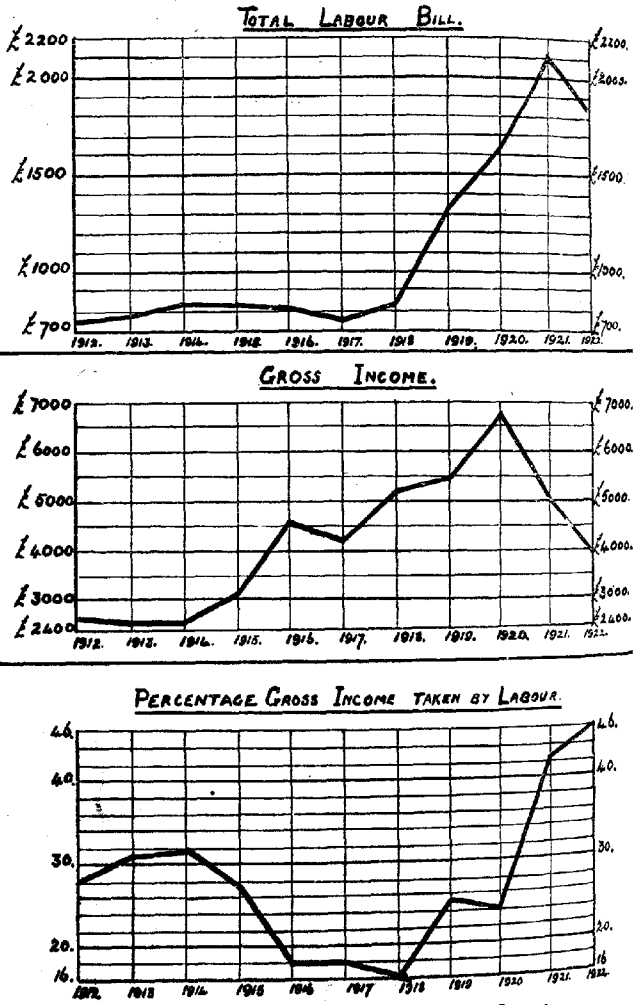


FIG. 3.—Relation of Cost of Labour to Gross Income.

The recommendations of the Conciliation Committee as from 1st October, 1921, for a 50-hour week, have been for the East Riding, 39s. to 26th November, 1921; for the North Riding, 40s. to 26th December, 1921, and 37s. to 1st March, 1922. The average at the present time is approximately 35s.

In pre-war days, the average farm labourer would receive as wages approximately 20s. per week, and the Wages Board award of 23rd October, 1920, theoretically increased the wages bill on the farm to approximately two and a half times its pre-war figure; but the limitation of hours and the necessity of employing more hands or the working of overtime by the existing staff actually increased the wages bill in most cases to three and in some cases to four times its pre-war figure.

On the four farms mentioned above, the actual effect of the shorter hours worked as a result of the operation of Wages Board Orders is shown by the following table:—

TABLE II.

NUMBER OF MEN EMPLOYED.

Farm	Year ending April 6th										
	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
H.	1	1	1	1	1	1	1	1	2	2	2
M	16	16	16	16	16	16	17	17	15	14	14
D.	4	4	5	5	5	6	6	6	6	7	7
C.M.	11	11	11	11	11	10	10	11	12	14	14
	32	32	33	33	33	33	34	35	35	37	37

It will be seen that the number of men employed on the 1,300 acres concerned rises from 32 in pre-war days to 37 in 1921—an increase of nearly 16 per cent. Expressed differently, it would seem that the reduction in hours worked necessitated the employment of 7 men in 1921 to accomplish the work performed by 6 men in 1912.

The wisdom of the awards can be judged in one of two ways. It may be claimed that wages should rise in proportion to the cost of living, or, alternatively, that the amount paid in wages by any industry must be finally determined by what the industry can afford to pay.

It is interesting therefore to compare the wages actually paid on the various farms when viewed from both these standpoints.

Comparison of Wages with Cost of Living.—In Fig. 2, an attempt has been made to correlate the wages actually paid on all the farms whose records go back to 1914, with the varia-

tions in the cost of living. The wages bills on all the 12 farms have been totalled each year, and reduced to a figure which corresponds to a standard of 100 for the year ending 31st March, 1914. The comparative costs of living have been deduced from the index figures published each month in the Labour Gazette, taking the prices prevailing in 1914 as 100, and adding to that each year the average percentage increase during the period 1st April—31st March.

TABLE III.

COMPARISON OF WAGES BILLS IN YORKSHIRE WITH COST OF LIVING.

Year	Comparative Wages Bill	Comparative Cost of Living
1913-14	100 ...	100
1914-15	104 ...	104
1915-16	114 ...	129
1916-17	119 ...	154
1917-18	143 ...	182
1918-19	174 ...	200
1919-20	227 ...	218
1920-21	275 ...	255
1921-22	249 ...	203

It will be seen that up to 31st March, 1915, the slight increase in wages on the farms in question coincided exactly with the slight increase in the cost of living. From then up to the end of March, 1918, the cost of living rose much more quickly than the rise in wages, by which time wages had risen 43 and the cost of living 82 per cent. Judging from this standpoint, the Wages Board was not appointed a day too soon.

From then up to March, 1921, farm wages rose more rapidly than the cost of living, the two curves crossing approximately in January, 1920.

When the Wages Board was dissolved in 1921, and Conciliation Committees were set up under the Corn Production Acts (Repeal) Act, 1921, the percentage increase in the wages paid on the farms was approximately 20 points above the percentage increase in the cost of living. By April, 1922, when the cost of living was falling more quickly than the wages on the farms, there was a difference of 45 points in favour of the increased wages.

It would appear therefore that while the Wages Board Awards up to April, 1920, were more than justified, the last increase in October, 1920, could hardly be looked upon in the same light. It is, however, only right to bear in mind that what the farm worker, looking at the matter from his own point of view, might

onsider he had lost up to January, 1920, owing to the failure f the rise in his wages to keep pace with the rise in the cost f living, would only be recovered by April, 1923, provided his ages and the cost of living remained stationary at the present vel, or both fell in the ratios in which they have fallen since he appointment of the Conciliation Committees.

According to the index figures as published in the Labour azette, the cost of living reached its maximum in November, 920, when it stood at 176 points above the pre-war level. Since hen it has dropped fairly consistently until by April, 1922, it tood only at 88 points above the standard. It is interesting herefore to consider how closely the rise and subsequent fall in gricultural wages agreed with those which obtained in other ndustries.

Rise of Agricultural Wages Compared with those of other ndustries.—Briefly it may be stated that as compared with those hat have obtained in other industries agricultural wages were low to rise, and have again been slow to fall, that while as far s can be traced the maximum increase of wages in the agricul- ural industry has only been exceeded by the maximum increases n the wages of the building trades labourers and railway orkers, the increases which prevailed in March, 1922, were nly approached by those which prevailed in the printing trade; nd that while at that time agricultural wages stood at 148 per ent. above the pre-war level, wages in the woollen trade were 5 per cent., in the cotton trade 61 per cent., and miners' wages nly 45 per cent. above pre-war level.

While in an article of this description it is impossible to quote he wages variations in all the 24 industries, it appears that rom the agricultural worker's point of view the rise in agricul- ural wages with the rise in the cost of living will bear comparison ith the increase granted in any other industry.

In the comparisons which have been made it must, however, e remembered that the figures relate to percentage increases nd not to actual increases. Owing, then, to the low pre-war ate of farm wages, any actual increase obtained is reflected as greater percentage increase than would be the case in other ndustries with a higher pre-war rate of pay.

It has already been suggested that while from the labour oint of view wages should be determined by the cost of living, et the employer demands that they should be determined by hat the industry can afford to pay. An estimate of this latter

sum can be obtained by a study of the varying *Gross Income* derived from the industry on certain farms, or, better still, from a study of the varying *Net Output*.

Relation of Cost of Labour to Gross Income from Farming.—The graphical representation in Fig. 3 illustrates the relation of labour costs to gross income.

It will be seen that on this farm of 312 acres, the wages from 1914 to 1918 remained approximately constant, though the gross income from the farm had during that time been more than doubled. Up to the intervention of the Wages Board, the men were reaping no advantage from the increasing prosperity of the farm. As rents were remaining constant, presumably it was the farmer who was reaping the whole of the benefit. If this is typical of other farms, it looks as if in justice to the worker the Wages Board might with advantage have been set up at least two and probably two and a half years earlier. Continuing the curves in Fig. 3 it will be seen that the gross income derived from the farm reached its maximum in 1920.

During the next year, in spite of the fact that with falling prices the gross income from the farm was rapidly falling, the successive awards of the Wages Board were steadily increasing the wages bill. During the last year of the series, with the advent of the Conciliation Committee, wages on the farm fell, but not at all so sharply as the fall in the gross income derived from the farm. On this particular farm, during the year 1921-22, 46 per cent. of the total gross income was required to pay the labour bill alone.

Looking at the bottom graph in Fig. 3, it will be seen that during the years 1915 to 1919, and possibly up to 1920, labour was apparently not getting its fair share, but that from 1920-1922 it was certainly getting more than its share. Provided we had taken the 1914 figures as our standard and labour on the farm had been prepared to accept as its share the proportion which the farm could apparently afford to pay, it would have received as wages in—

1914-15	...	...	...	£870	instead of	£825	actually paid.	
1915-16	..	...	...	1,340	„ „	808	„ „	
1916-17	...	...	...	1,220	„ „	779	„ „	
1917-18	...	...	...	1,560	„ „	834	„ „	
1918-19	...	...	...	1,600	„ „	1,336	„ „	
1919-20	...	...	...	2,000	„ „	1,650	„ „	
1920-21	...	...	...	1,520	„ „	2,118	„ „	
1921-22	...	...	...	1,200	„ „	1,841	„ „	

In other words labour might complain that up to 1920 it had received as wages £2,800 less than what it might perhaps with reason have claimed as its share, but might congratulate itself that during the years 1920-21 and 1921-22, it had been paid £1,200 more than its share.

These figures have been arrived at by a comparison of the wages and *gross* income from the farm. It is, however, fairer to try and get a comparison betweeen wages and net income, or even net output, the net output being the fund available for payment of profits to the farmers, rent to the landlord and wages to the men.

Relation of Cost of Labour to Net Output in Farming.—According to Orwin's figures,* which agree fairly closely with those we have obtained in Yorkshire, in 1913-14 labour was taking 33 per cent. of the net output, the farmer 45 per cent.; in 1916-17 labour took 27 per cent., the farmer 61 per cent. In 1919-20 on 11 Yorkshire farms of 2,738 acres, on which the net output averaged £9 4s. 7d. per acre, labour took 49 per cent.; in 1920-21, on 19 Yorkshire farms of 4,471 acres, on which the net output was £5 12s. 2d. per acre, labour took 78 per cent., and in 1921-22 on the 29 farms in the same county comprising 6,515 acres, whose full accounts are at present completed, labour took 84 per cent. of a total net output of £4 4s. 9d. per acre. Judged from the standard of the net output, from the outbreak of the War up to 1917-18 labour was not, as has before been pointed out, receiving its fair share of the increased prosperity of the industry, but for the last two years at least it has been getting more than the industry could reasonably be expected to bear.

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* *Journal of Royal Agricultural Society*, Vol. 82, p. 155.

GROUND MINERAL PHOSPHATES AS MANURES.

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Dr. Aitken's Experiments in Scotland, 1879-1889.—Trials of ground mineral phosphates were made for many years at the Pumpherston Agricultural Experimental Station of the Highland and Agricultural Society of Scotland, by the late Dr. Aitken, Chemist to the Society. The results are now of special interest when ground mineral phosphates are again being offered to farmers in considerable quantity. Dr. Aitken conducted trials for seven years previous to 1886, and found these ground mineral phosphates very erratic in their action. He concluded* that their utility varied with the softness of the mineral, and with the fineness of grinding. The phosphates which produced the best results were Carolina land phosphate, Belgian phosphate, and Aruba phosphate, but these were also the finest ground. He reported that they produced better results in wet than in dry seasons, and that they acted best on land rich in organic matter. He also found that phosphatic guano and precipitated phosphate acted better than ground mineral phosphates, but that bone ash did not act so well. He concluded that superphosphate was the most reliable kind of phosphate for general use, but that with a more thorough system of grinding the dissolving of phosphates might be dispensed with.

In the following year Dr. Aitken recorded† most valuable results on the value of mineral phosphates of different degrees of fineness. In 1886 he conducted at Pumpherston trials of basic slag containing 40 per cent. phosphates (then a new manure), and the following ground mineral phosphates:—Curaçao, 87 per cent. phosphates; Canadian, 59 per cent. phosphates; Carolina, 57 per cent. phosphates; and Belgian, 40 per cent. phosphates; and also of superphosphate, 28 per cent. soluble phosphates. The crop was turnips and the plots were one-twentieth of an acre in area. In all cases the plots received (per acre) 100 lb. of sulphate of ammonia and 60 lb. of sulphate of potash (50 per cent. potash). He found, although all the ground mineral

* *Transactions* of the Highland and Agricultural Society, 1886, p. 351.
† Do. do. , 1887, p. 245.

phosphates appeared to be finely ground, that less than 50 per cent. of each would pass through a sieve of 120 wires to the linear inch. He therefore had all these mineral phosphates sifted, and tested each of them as:—

(1) Sifted—all passing through a No. 120 sieve, and

(2) Unsifted—from 40-50 per cent. passing through a No. 120 sieve.

The same amount of phosphoric acid (about 100 lb. an acre) was applied of each, so that the quantities per acre were: Superphosphate, 800 lb.; Basic Slag, 560 lb.; Curaçao, 260 lb.; Canadian, 360 lb.; Carolina, 400 lb.; and Belgian, 560 lb.

On the average the weights per acre of the turnips were:—

	Tons.	*Cwt.*
No phosphates	9	9
Superphosphate	11	9
Basic slag	11	13
Mineral phosphates sifted	11	17
Mineral phosphates unsifted	10	18

He summed up the results thus:—

"1. Ground mineral phosphates are the more active the more finely they are ground.

"2. When ground as finely as to pass through a sieve of 120 wires per linear inch, they are nearly as active as superphosphates.

"3. The nature of the phosphate is of much less importance than the fineness to which it is ground.

"4. Basic slag is at present (1886) the most finely ground and the cheapest phosphate on the market."

Dr. Aitken conducted such trials for many years, not only at Pumpherston, but on farms in all parts of Scotland. Many of his trials with ground mineral phosphates were disappointing and he believed that the lack of fineness of grinding caused a number of the poorer results. The advent of basic slag, the good results it gave, the fact that it could be readily obtained ground to a standard fineness, and also that phosphates could then be obtained at a cheaper cost per unit in this than in ground mineral phosphates, all tended to discourage further experimental work with ground mineral phosphates at that time.

In 1889 Dr. Aitken stated that a unit of phosphate of lime cost 1s. 1d. in mineral phosphates and only 11d. in basic slag. In 1896 he put their relative costs at 8½d. and 1s. 2½d. Since that time the phosphates have usually been at a lower cost per unit in mineral phosphates than in basic slag. There were for some time, however, abundant supplies of basic slag, and

very little experimental work was done with mineral phosphates. Quotations for most grades of basic slag are now about 2s. 5d. per unit of phosphate of lime at the farmer's nearest station, whereas in the north of England finely ground North African phosphates, containing 60 per cent. of phosphate of lime, and guaranteed that 80 per cent. will pass through a No. 120 sieve (14,400 holes to the square inch) are now offered at about 1s. 4d. a unit at the farmer's nearest station. The great alteration in the relative commercial values of these two phosphatic manures makes the late Dr. Aitken's results now of great interest and value, and especial attention should be given to his advice, repeatedly and emphatically made, that mineral phosphates applied to the land are of use as manures only when they are ground to the finest flour.

Trials at Cockle Park, 1911-14.—Trials of various phosphatic manures for three years' seeds hay were made at Cockle Park in the three years, 1911-1913, 10 cwt. per acre of high-grade basic slag, or an equivalent amount of phosphates in other dressings, being applied when the corn crop was harvested. On the average of the three following years the amounts of hay produced per acre were:—untreated plot, 33¼ cwt.; basic slag plots, 38¼ cwt. to 41¼ cwt.; bone meal, 40¼ cwt.; Tunisian rock phosphate, 37½ cwt.; and Belgian rock phosphate, 40¼ cwt.

Similar trials were made for the three years, 1912-14, when the average crops of hay per acre for the three years were:—No dressing, 33⅓ cwt.; basic slag plots, 39½ to 41 cwt.; bone meal, 37 cwt.; Tunisian phosphate, 39 cwt.; and Belgian rock phosphate, 40 cwt. (See *Guide to Cockle Park*, 1917.)

These and other trials showed that ground mineral phosphates gave results practically equivalent to basic slag.

Trials at Wylam-on-Tyne, 1914.—Trials of mineral phosphates on the park at Close House, Wylam-on-Tyne, were commenced in March, 1914, when basic slag, Belgian phosphate and Algerian phosphate were applied to different areas of the park, 200 lb. an acre of phosphoric acid being applied in each case. A careful inspection 2½ years later showed on all the treated areas a marked improvement due to these manures. The pasture on the untreated area was valued at 25s. an acre and that on the remaining areas at 45s. an acre. The results showed that when mineral phosphates are as finely ground as basic slag the phosphates they contain may be about equally effective.

Trials in Essex, 1915.—Dr. Robertson commenced trials in Essex in 1915 with mineral phosphates and basic slag. The results of these trials are given in the September issue of this *Journal*, page 519. He concludes that as a source of phosphate for the manuring of grass land, the value of mineral phosphates is very close to that of high-grade basic slag, and that, of the various types of rock phosphate, Gafsa (a North African phosphate) seems to be the most suitable for direct application.

Trials at Cockle Park, 1917.—In October, 1917, 11.1 cwt. per acre of high-grade basic slag and 8.8 cwt. per acre of Tunisian phosphate were applied to small plots of old pasture of a poor character at Cockle Park. Each dressing contained 200 lb. phosphoric acid. The dressings were repeated in October, 1920. A recent inspection of these plots shows a marked improvement over the untreated plots, and it is difficult by observation to say which have been most effective.

It is again urged that the greatest importance should be attached to fineness of grinding. The eye is not a safe test in judging of this fineness, so that samples should be obtained before purchase for examination and guarantees as to fineness of grinding. It is usual to guarantee that 80 per cent. of basic slag and other finely ground mineral phosphates will pass through a No. 100 sieve, containing 10,000 holes per square inch. It is now possible to obtain these mineral phosphates, with a guarantee that 80 per cent. will pass through a No. 120 sieve, containing 14,400 holes per square inch.

Trials at Cockle Park, 1922.—An important trial of phosphatic manures on poor grass land was commenced at Cockle Park in the North Field, Paradise, in February, 1922. Alongside the other dressings North African phosphates were applied to two plots at the rate of 6 cwt. per acre. This contained 63 per cent. of phosphates. In one case the fineness of grinding was 79 per cent. through a No. 100 sieve, and in the other 83 per cent. through a No. 120 sieve. The results already indicate that the more finely ground phosphate has developed clover and pasture plants more effectively than the other, and also that, so far, the results of this finely ground phosphate are quite comparable with that of high-grade basic slag.

The following table shows the approximate costs of high-grade basic slag and of finely ground North African phosphate, as offered to farmers in the north of England in September last:—

	Phosphates.	*Price per ton.*	* *Price per unit.*	*Nineteen units per acre in* † *cwt.*	*Cost per acre.*
	per cent.	s. d.	s. d.		s. d.
Basic slag	38	91 0	2 $4\frac{3}{4}$	10	45 6
Ground North African phosphate	60	80 0	1 4	$6\frac{1}{3}$	25 4

* Carriage paid to farmers' stations.
† Containing nearly 200 lb. phosphoric acid.

The basic slag is guaranteed that 80 per cent. will pass through a No. 100 sieve, containing 10,000 holes to the square inch; and the North African phosphate that 80 per cent. will pass through a No. 120 sieve containing 14,400 holes to the square inch.

[In an early issue of the *Journal* it is proposed to publish an article on Naura phosphate.]

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THE PLANNING AND CONSTRUCTION OF FARM BUILDINGS:

A MODERN HOMESTEAD.

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THE planning and construction of a completely modern homestead is at the present time by no means an easy problem, and the publication of the plans for the new farm buildings at Seale-Hayne Agricultural College may be of interest, particularly as the scheme presents at least one departure from the accepted normal type.

The Traditional Type.—Since the middle of the last century, although variations may be found in detail in different parts of the country, the planning of the buildings of the larger farms in England has followed a more or less definite type.

The generally accepted principle has been to place what may be termed the administrative building, consisting of the accommodation for food storage and preparation and the accompanying necessary machinery, in a two-storied building on the north side of the steading, with the buildings containing stock arranged at right angles projecting southwards in two or more arms. The spaces between these ranges or wings are used as covered or open stock yards in which the main bulk of the farmyard manure is produced and kept until ready for distribution. Frequently, on the larger and more extensive holdings, this arrangement is duplicated.

Broadly speaking, where completely new buildings have been erected, the main objects have been to facilitate the economical distribution of prepared food stuffs and to provide shelter and accommodation for animals in the most concentrated manner.

In many cases the buildings have been elaborate and costly in construction, conveying the idea that the then methods of farming were fixed for all time and that "adaptability" was a word undreamed of.

Present Day Conditions.—Before describing the accompanying plans it may be wise to analyse briefly a few of the more pressing problems of the moment, pertaining to farm design and construction, as applied to larger holdings.

Leaving the specialist out of account, it is probably correct to say that for general farming purposes the primary need is sound and economic planning designed in every possible way to limit capital expenditure, to cheapen production by ease and economy of labour and economy in annual maintenance, while in addition to these there is an ever-growing demand to find the best possible solution for the hygienic well-being and improvement of stock of all kinds and at the same time to increase production.

Another important factor is the demand for the production of clean milk, which in turn compels action of a more or less restrictive character to achieve the end in view.

In addition to these facts, there is the almost daily increasing importance of scientific research applied to every branch of husbandry, and it is therefore evident that the whole business of farming is passing through an exceptional period of transition. If these facts are admitted, it is all-important for the farm architect to keep an open mind, to watch for any signs of new ideas and methods designed to meet the problems of the moment, or to forestall the advent of those to come in the near future.

It is seriously suggested that the proper planning of farm buildings offers to the designer at least as many problems in arrangement and construction, albeit the latter may be of simple type, as any other scientific or commercial undertaking, but with one very important addition.

In most building undertakings of a commercial character there are two chief factors: (1) The efficiency, health and comfort of the human beings employed in the business, and (2) the convenience and efficiency of the building for its immediate purpose. In the planning of farm buildings we have

in addition the very vital problem of the health and well-being of various kinds of animals living under artificial conditions.

Our method of research into this latter problem is almost entirely empirical, and the best results are only attained by the somewhat crude method of trial and error and by examining into the causes of repeated failure or success.

It is true that a science of animal hygiene is being gradually built up, but in actual practice it is frequently found that the most elaborately planned and constructed buildings, where every care has been taken to give effect to current ideas, have failed to give the best results hoped for, while some simple and elementary arrangement answers all purposes.

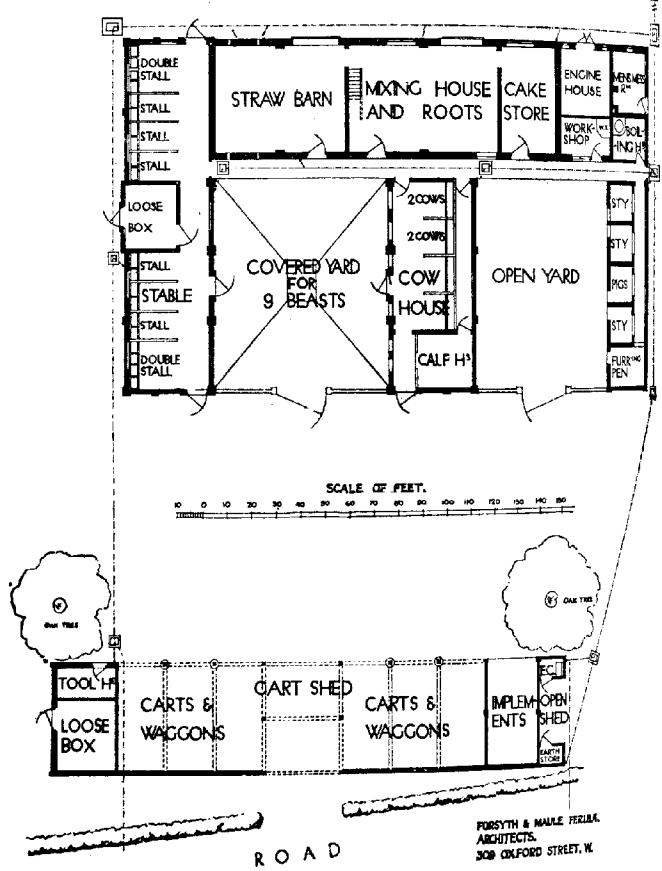


FIG. 1.—Plan of Farm Buildings, Newtown Farm, Lymington.

With the economic stringency of the present time and the necessity for an improved return on capital, it is obvious that the line of attack must be one which embraces cheap construction and at the same time allows of adaptability for future needs and improvements.

As has been said before in these articles any departure from accepted principles should be watched with interest, and, if found successful in practice, will form the basis for future development.

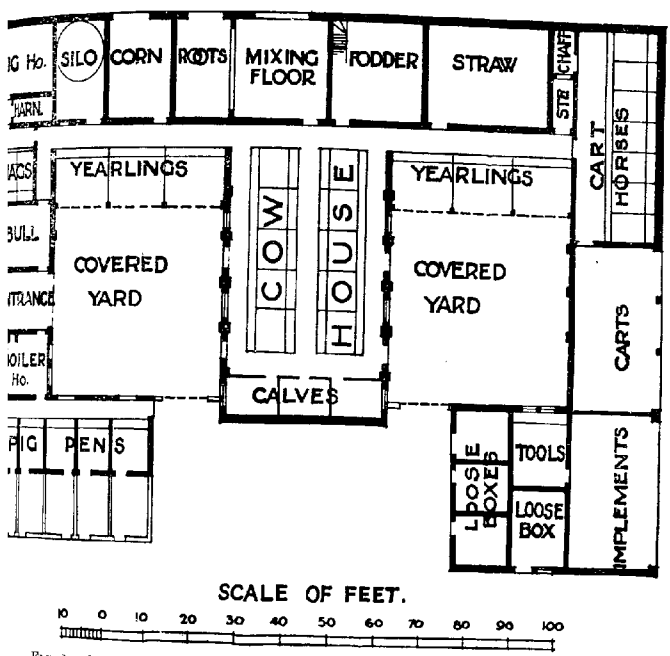


FIG. 2.—Original plan of Farm Buildings, Seale-Hayne Agricultural College.

A Traditional Plan, 1903.—The first plan (Fig. 1), given for the purpose of illustrating the traditional type referred to above, is that of a farm steading in Hampshire designed and built in 1903. The farm contained about 300 acres, mostly arable, and accommodation was required for a very limited number of cows, provision being made for eight. The cow house formed the centre range with a covered yard on one side and an open yard on the other, but access for the cows was provided without necessitating the crossing of either yard. The distribution of fodder to each wing is simply and directly

arranged for from the administrative block, and some care was taken for the comfort of the farm workers by the provision of a mess room. The plan may be said to be compact and straightforward, but the position of the cow house between two stock yards should no longer be considered ideal.

A Traditional Plan, 1914.—The second illustration (Fig. 2) shows the original plan for new farm buildings prepared for the Governors of Seale-Hayne Agricultural College, Newton Abbot, and is interesting as showing a distinct adherence to traditional type—in fact it is to all intents and purposes as true to accepted principle as is the earlier plan of Newtown farm shown in Fig. 1. Originally prepared before the War nothing was actually done with regard to building until 1920 when the state of the existing farmstead at the Seale-Hayne College made a reconstruction imperative.

A review of the then situation, however, made it clear that the proposed plan, though excellent in itself, maintained the traditional position for the cow shed with its obvious disadvantages from the modern hygienic standpoint. Further, the plan did not lend itself well to future extensions or modifications in farming practice and was considered hardly sufficiently adaptable for modern scientific and experimental farming.

A New Type.—The third illustration shows the general lay-out plan of the new buildings as finally approved by the Governors and passed by the Ministry of Agriculture. It should be mentioned that the site is an exceptionally difficult one owing to the uneven nature of the ground, the character of the approaches, and the position of existing buildings, such as the dairy and College workshop already erected in 1914.

In view of future legislation with regard to the production of clean milk, and the intention of the Governors to keep a herd of dairy cows, the authorities at the Ministry of Health were consulted with regard to the placing and arrangement of the cow-house. The suggestion of the Ministry of Agriculture that the traditional position of the cow-house should be changed so that it no longer abutted upon stock and manure yards was welcomed, as it has long been proved that the main source of milk contamination is from minute particles of manure, from which it follows that proximity to a manure yard or pit must of necessity increase the risk of contamination. It is noteworthy that this departure from the normal and accepted type was decided upon on its own merits and was not due in any way to the falling ground or any peculiarity of site.

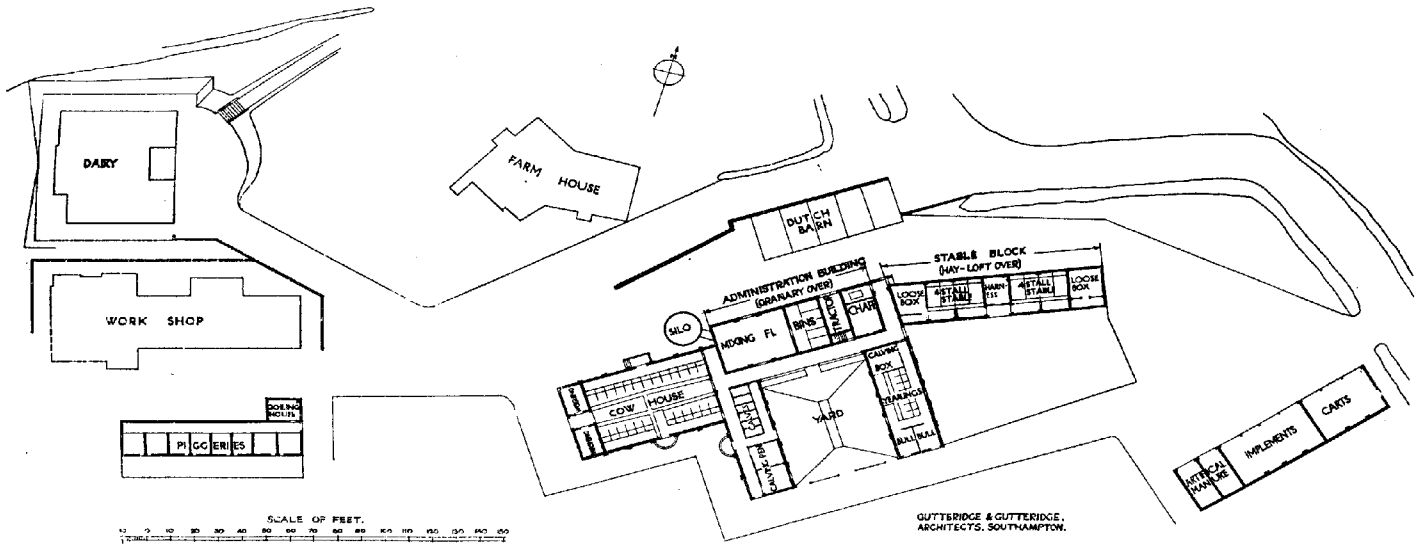


FIG. 3.—Plan of Farm Buildings as finally adopted, at Seale-Hayne Agricultural College.

A reference to the plan (Fig. 3) shows that the main administrative range occupies a normal position to the north, with Dutch barn and silo adjacent, but the cow house is placed to the west, though still in immediate proximity to the mixing floor and silo. Space has been provided for milk weighing and recording and for the men's lavatory. The cows enter off a hard road on the south side and milk is taken out to the dairy by a separate exit at the west end. The chief merit of this arrangement is that the cow-house is no longer in an enclosed position but is, as far as possible, isolated from the remainder of the buildings, open to sun and air on three sides, and free from the dust and flies inseparable from stock yards. The disposal of manure from the cow-shed will be by a gravitation trolley to a covered manure pit or into the stock yard.

The two southward projecting blocks are normally placed with a yard between, which it is intended to cover in when funds are available.

The position of the stables stretching eastwards from the administrative block and the position of the cart and implement shed were largely dictated by the nature of the site and the importance of obtaining an easy graded access.

Another point worth noting is the isolated position of the pigsties, to which whey will be gravitated from the dairy on the higher ground above.

The most careful consideration has been given to the practical arrangements for storing, preparing, and distributing fodder, and a reference to the plan will show that the departure from type, while it has distributed the buildings in a less confined form, has not materially increased the difficulties of food distribution.

It is not intended in this article to do more than draw attention to the general principles involved in the planning of these farm buildings, particularly with regard to any departure from the normal type, but it is urged that in this scheme the College authorities and their architect have introduced an important new principle in the relative position of the cow-shed to other buildings whereby the hygienic conditions requisite to assist in the production of clean milk must be materially better than could be the case were the traditional lines followed. It is also claimed that, so far as administration is concerned, both in feeding and cleaning, there is no loss but rather gain in efficiency and economy.

So far as the construction is concerned a permanent type was decided upon for various reasons, but it is suggested that this scheme lends itself to the method adopted by the Directors of the National Institute for Research in Dairying—*i.e.*, the administrative block, cow-house, and stables might be constructed in permanent materials, and the covered yard and south ranges might be built of timber with a light truss roof construction and cheap covering material. Such a method would admit of easy and cheap extension to the east when the conditions of farming required increased room for stock.

There can be little doubt that, at the present time when initial cost in construction is high and farming conditions are in a state of transition, adaptability is a very important factor, and there is therefore much to be said for building in such a manner that alteration and extension may be easy and cheap.

In conclusion, the writer would like to express his thanks to Mr. R. F. Gutteridge, of Messrs. Gutteridge, of Southampton, architects to the Governors of Seale-Hayne College, for his kindness in permitting the publication of his plans and for his cordial co-operation in all negotiations concerning them.

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POSSIBILITIES OF FRUIT AND VEGETABLE GROWING IN DURHAM AND CHESHIRE.

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THERE are some things which philosophy seems unable to account for. One is markets—why did they establish themselves just where they are? Why do many of them persist in spite of everything? Better alternative sites for Covent Garden Market have been suggested: some attempts have even been made to establish rivals: none, however, has dethroned it. With all its inconveniences and its incongruities Covent Garden Market still remains a magnet, attracting produce to its congested space from all parts of the world, and it continues to derange and obstruct traffic in the heart of our metropolis.

Another problem is the areas of the country where market gardening thrives. Why on just this spot or that spot has a colony of intensive cultivators become established? Why just here or there have men solved the smallholding problem for themselves, and are thriving on holdings of smaller area than one would like to pronounce as possible? Superficially some reasons

leap to view. Proximity to some great market; some topographical peculiarity of site giving advantages of climate; some particular geological formation of soil; some tradition of cultivation handed on from generations back. It is when individual cases are examined below these surface reasons that one is puzzled. Other markets as great, or greater, have not attracted similar colonies. Equal advantages of site can be pointed out where no exploitation exists—soils of attractive suitability are calling in many places for intensive cultivators but without response—traditions of cultivation are kept alive in a few, whose number does not increase.

Such reflections as these came home with great force when the writer was recently visiting the County of Durham in connection with the new Horticultural Station at Houghall, and the County of Cheshire for a Conference at Reaseheath.

At Houghall sixteen acres are being developed for demonstrating methods of culture and varieties of fruit and vegetables. Very little cultivation of this nature is done in the county, and an industrial population must draw its supplies of fruit and vegetables burdened with transport charges either from overseas or from other parts of the Kingdom—in either case losing the valuable quality of freshness. It may be said that the climate is atrocious or the soil unsuitable, but visits to some of the few growers in the county, and inspections of some of the allotments by no means support such a theory. In a village within twenty miles of a city in the county of Durham there is a grower who, on three-and-a-half acres is practising the most intensive culture with complete success, producing flowers, vegetables and fruit in profusion. He manages to get forced rhubarb, annuals, and bedding geraniums, tomatoes and grapes, from the same greenhouse in the same year. His Victorias, Czar, and Rivers Prolific plums were breaking down with fruit. He had heavy crops of Doyenne d'Eté and Fertility pears, as well as Grenadier, Lord Grosvenor and Bramley's Seedling apples. There was nothing that one could see exceptional either in site or soil. At another village in the same county there was a county council smallholding where a plot of fruit—apples, pears, and plums, with bush fruit and strawberries—had been planted under the advice of the horticultural instructor, and these were all healthy and thriving. One asks the question "Why has not the splendid market afforded by the large population in this area attracted more growers to benefit by it, and in so doing benefit the people therein as well?" It is to be hoped that Houghall will not only

suggest improved methods and better types to the existing growers, but will lead others to seize the opportunity which is afforded them.

In Cheshire the surprises in store were of a different character. Here, the county that in imagination had been pictured as stocked with mottled herds and redolent with cheese making, turned out to be carrying on extensive industries in intensive cultivation of fruit, vegetables and flowers. How many know that on the borders of Cheshire, overflowing into the neighbouring Welsh county of Flint, there is a firm of growers who cultivate 300 acres of strawberries; whose undertaking extends to 1,200 acres, and is devoted to three crops, namely, potatoes, spring cabbages, and strawberries—an establishment revealing a standard of cultivation, and an organisation that can challenge comparison anywhere.

In another part of the county there is gathered a colony of intensive cultivators whose holdings are admirable examples of "How to make the most use of the land," where clean cultivation, sustained fertility, and ingenious close cropping can be seen as well as anywhere in the world. In another district one finds that the soil, which is specially adapted to the growing of pears, has long been discovered by the local growers, although most of the sorts grown are of many old varieties, and the possibilities of development still await exploiting. The enterprise of a fruit merchant in planting out some 60 acres of top and bottom fruit of all kinds should, if as successful as it promises to be, give a stimulus to further development. In another area where some seaside marshes have been reclaimed by draining and hedging and years of intensive cultivation, there is a source of supply of vegetables which must be of great value to the population of Birkenhead and Liverpool, and one is surprised to know that the cultivators are nervous of the possibility of their being displaced by building operations.

In the midst of such a county, with so many alert and enterprising growers, and so many potentialities waiting for exploitation, the Horticultural Department of Reaseheath Agricultural Institute should have an important sphere of influence. There are still new methods that could be demonstrated. There are yet types of vegetables and fruit apparently unknown to the local growers, and especially there is a wide field of opportunity for demonstrating methods for combating diseases and pests.

The opening of two such demonstration stations is an event of great importance, and one can only hope that other counties in England will be able to follow along the same road.

THE POTATO FLOUR INDUSTRY IN HOLLAND.

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THE potato flour industry in Holland developed during the second half of the 19th century on the " fen-colonies " in the northern provinces of Holland—Groningen, Drenthe, Overysel and Friesland—where circumstances were specially favourable to the extension of this industry. These districts formerly consisted of vast stretches of moorland sparsely inhabited, and covered with layers of peat many feet deep. Even in the 17th century some of these peat bogs were under cultivation, and since that time hundreds of canals have been dug, affording excellent means of transport by water. By the application of nitrogenous and potash manures the soil has been rendered specially suitable for the cultivation of potatoes, while fairly efficient and inexpensive labour has been available among the peat workers of the district. The development of the industry appears, in fact, to have been due to the combination of suitable soil, good canals, cheap fuel and labour, and the increasing demand for potato flour for different purposes.

In 1840 the first potato flour factory was established in this part of the country, and since then many more factories have been built. After 1890 frequent disputes between the growers and manufacturers about the price paid for the potatoes led to the foundation of several factories on a co-operative basis, and at the present time most factories work on a co-operative basis.

The members of these co-operative factories undertake to deliver quantities of potatoes proportionate to the number of shares they possess, and they are responsible for the debts of the society in the same proportion. At the end of the financial year every shareholder participates in the profit on the sale of flour.

The capital necessary for building a large modern mill, producing about 10,000 tons of flour, amounts to 1,200,000 Dutch guilders (about £100,000), while in addition a working capital of about £60,000 is required. At the present time there are over thirty potato flour mills in the Netherlands. The co-operative mills originally formed the " *Growers' Association of Flour-mills,*" whilst the others formed the " *Association of Private Flour Manufacturers.*" These associations were founded to

meet the need of the manufacturers for information and mutual help, and had no concern with sales. The establishment in 1919 of the *Co-operative Sales' Office for Potato Flour* has, however, changed the system of selling direct from the factory. The task of this organisation is to sell the flour of its members in the most economical and profitable way, and to assist the manufacturers to solve problems concerning the improvement of methods of production, the increase of the output, and so forth. It is the opinion of the interested growers that on the whole the united co-operative factories now have a far greater influence on market prices than formerly, and this is mostly due to the activity of the Co-operative Sales' Office. The development of this office made the Growers' Association of Flourmills superfluous and it has recently ceased to exist.

While most Dutch industries are suffering greatly from the influence of the world crisis and the general trade depression, the co-operative potato flour factories have on the whole no reason to complain. Of late years the quantity of potatoes used for flour-making has been large, especially in 1919-20 and 1920-21, and flour prices are said to have been remunerative. The co-operative factories especially have profited by these favourable circumstances, because while the other factories have not always been able to obtain the necessary raw material, the co-operative factories, owing to the supply guaranteed by their members, have not met with this difficulty.

Of late years almost 70,000 acres of potatoes have been planted in the fen-colonies, where the average yield per acre amounts to 8, 9 or 10 tons. Only a small part is used for direct human consumption or cattle-food, the bulk being used for flour-making unless a bad harvest or any other crisis in the neighbourhood abnormally increases the demand for direct consumption.

All the Dutch factories together can use about 90,000 tons of potatoes a week, but the factories only work at their topmost capacity during harvest time and in the months of October, November and December. There are, however, a few factories that start in September and finish in January. During the remaining months of the year the material undergoes further manipulation, and in this way various qualities of flour are manufactured.

The quantity of potatoes delivered to the flour factories naturally varies with the harvest, and as mentioned above the co-operative factories have now absorbed the bulk of the trade. Figures for three years before and since the War are given below.

	Co-op. Mills. tons.	Other Mills. tons.	Total. tons.
1910/11 ...	244,000 ...	305,000 ...	549,000
1911/12 ...	228,750 ...	137,250 ...	366,000
1912/13 ...	405,650 ...	426,085 ...	831,735
1919/20 ...	523,075 ...	78,385 ...	601,460
1920/21 ...	508,740 ...	55,815 ...	564,555
1921/22 ...	329,095 ...	14,333 ...	343,430

The average production of flour is estimated at 380 lb. per ton of potatoes delivered at the flour mill. In normal years about 25,000 tons of flour are used in the Netherlands, the balance being exported.

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A SAFE METHOD OF PREVENTING "BUNT" IN WHEAT.

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THERE is perhaps none of the common fungus diseases of farm crops that more urgently needs attention at the present time than "Bunt," or "Stinking Smut," of Wheat.* In the years since the War, complaints of its increasing prevalence have been made from all parts of England. Professor R. H. Biffen, referring more especially to the wheat lands in the Eastern Counties, has written: †"Bunted wheat is far commoner than it should be. In part this is due to the fact that a good deal of the grain sold for seed purposes is infected. Buyers should be more on their guard, and if a single 'bunted' grain can be detected in a seed sample, that should be a sufficient reason for rejecting it. The reason for this apparently drastic course is that many vendors are too prone to assume that wheat can be adequately cleaned by the simple process of blowing out such grains. But whilst it is true that the *spore*-filled grains (bunt) can be removed in this manner, no wind current will dispose of the myriads of spores which inevitably find their way into the grooves of the grains or the brushes of hairs at their tips during the threshing of the crop."

Losses.—In a recent number of this *Journal*‡ outbreaks of bunt were recorded in Herefordshire, Shropshire, Cambridge-

* An illustrated Leaflet (No. 92) on Bunt, giving the full life-history, can be obtained post-free on application to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W. 1.

† *Jour. Roy. Agric. Soc. of England*, 81, p. 244 (1920).

‡ Vol. XXVIII, 1921, p. 730.

shire, Lancashire, Gloucestershire and Lincolnshire where from 25 to 55 per cent. of the ears were attacked. The following case is also recorded:—in a northern county a chance sheaf of wheat was taken from the binder and the ears counted: 525 were found affected with bunt and 563 free, *i.e.*, 48 per cent. of the wheat was infected! In Kent—East Kent, Mid-Kent and the Weald—bunt is far too prevalent, and serious infestations have occurred in crops of the varieties Standard Red, Yeoman and Marshal Foch. In one case a farmer growing Marshal Foch for a firm of seedsmen, had the crop thrown on his hands on account of the prevalence of bunt.

Whilst the worst infected fields are doubtless due to the farmer saving seed from a bunt-infested crop, the disease is present also in seed-wheat sold by seedsmen. In 1921, in a field of wheat (Standard Red) grown on Wye College Farm from seed supplied by a firm of seedsmen in the south of England, a counting of a sample of 1,000 ears in the field showed 5.1 per cent. of bunted ears—a serious infestation.

Pickling of Seed.—In 1921, in this *Journal*,* the writers pointed out: (1) that the common method of "pickling" wheat with a solution of "bluestone" (copper sulphate) was too dangerous, experiments showing that a solution of bluestone sufficiently strong to kill the spores of bunt present on the seed-wheat causes serious injury to the germination of the wheat; and (2) that a certain method of using a solution of formalin kills the bunt *spores* without appreciably affecting the germination of the seed-wheat.

Further field experiments have been carried out in 1921 and 1922, and their results, described below, show very clearly that by the use of a very dilute solution of formalin a simple, safe and cheap method exists for the prevention of bunt.

In our previous article cited above we wrote: "It is to be feared that many cases of a 'poor plant' in wheat may have been caused by the seed having been 'pickled' with too strong a solution of copper sulphate." Evidence we have collected since confirms this opinion. From inquiries we have made of farmers we have ascertained that it is often the case that a field sown with seed-wheat treated with a 10 per cent. solution of bluestone will show a poor and tardy germination, while where it has happened that a portion of the same field has been drilled with untreated seed-wheat of the same kind the germination has been good and quick. In one case a farmer (in East Kent) sent

* Vol. XXVII, 1921, p. 1013.

us some seed-wheat (Standard Red) which he had "pickled" in the traditional method with a 10 per cent. solution of copper sulphate (using 1 gal. to the 4 bushels). Comparing the germination of this seed with that of an untreated sample of the same seed, it was found that the "pickled" seed germinated only 47 per cent. in 10 days, increasing after 15 days to 57 per cent., and reaching finally 60 per cent.; the untreated seed germinated 98 per cent. in 4 days. In another case, where the same method was employed, again by a farmer, the treated seed (Marshal Foch) germinated only 70 per cent., while the untreated seed gave 100 per cent. germination.* Here, then, the farmers were killing from 30 to 40 per cent. of the seed-wheat before sowing it. Assuming that 2½ bushels of seed to the acre is the correct amount to be sown, there may thus be a sheer waste of ¾ to 1 bushel of seed-wheat to the acre. Sir Daniel Hall pointed out,† in 1920, that "if we could reduce the amount of seed used by one bushel an acre the country would gain 3 per cent. on its output of wheat, worth well over £1,000,000 a year at the present time.‡

I. Experiments during 1920-21.—The object of the experiments was to confirm previous results which showed that formalin was preferable to copper sulphate, and also to ascertain whether a more dilute solution of formalin than that previously used was equally effective.

The general method adopted was that described in the previous paper. Contaminated seed was obtained from the experimental plots of the preceding season and divided into 5 lots for treatment as shown in the table. Duplicate plots were sown (by hand) with each lot of seed, samples being retained and sent to the Official Seed Testing Station, where the percentage of germination was determined. As the plants grew the plots were examined periodically to see whether the treatment had had any adverse effect on the growth, but no difference in the general appearance of the plots could be seen. When the crops were harvested 1,000 ears were taken at random from each plot and examined individually for bunt. The results obtained were as follows:—

* We are indebted to Mr. S. T. Parkinson, Head of the Botanical Department, South-Eastern Agricultural College, Wye, for carrying out these germinating tests.

† This *Journal*, Vol. XXVII, 1920, p. 526.

‡ As is, of course, well known, good crops are frequently obtained from seed "pickled" with limestone. Until scientific investigations as to the correct rate of seeding have been made, it is open to any one to hold the view that a better crop is obtained by sowing the lesser quantity of viable seed caused by the bluestone treatment. The economic waste of seed would, of course, still remain.

TABLE I.

Treatment.	Percentage Germination.	Number of Bunted Ears per 1,000.	Percentage of Bunted Ears.
Formalin 1 : 320	98	(1) 6 (2) 4	0.5
Formalin 1 : 400	98	(1) 9 (2) 7	0.35
Formalin 1 : 480	99	(1) 4 (2) 10	0.7
Copper Sulphate 2.5 per cent.	99	(1) 46 (2) 62	5.4
Untreated	99	(1) 113 (2) 171	14.2

Discussion of Results, 1921.—In our previous article* we recorded the fact that formalin diluted 1 : 320 (1 pint to 40 gal. water) was as effective in controlling bunt as the 1 : 240 solution (1 pint to 30 gal. water) and was therefore to be preferred. The dilution 1 : 320 was the weakest used in all previous experiments; it was decided therefore to use in 1920-21, the weaker solutions 1 : 400 and 1 : 480, and contrast these with the solution previously used.

As will be seen from Table I all the formalin solutions gave satisfactory results, reducing the percentage of "bunted" ears from 14.2 to less than 1, the actual differences observed being perhaps within the experimental error. Since it was clear that the limit of dilution when formalin ceases to be effective had not been reached, it was decided to carry out a further series of experiments in the next year before publishing these results.

The one copper sulphate solution that was used, of 2.5 per cent. strength (2½ lb. to 10 gal. water), was the strongest that our previous experiments had shown could be used without seriously injuring the germination of the seed. As is shown in Table I, the control of bunt when using this copper sulphate solution was by no means satisfactory; the 5 per cent. of "bunted" ears that appeared in the plots would represent a very serious infestation in the field. In the writers' opinion the use of a copper sulphate solution, and also of the proprietary articles containing copper sulphate which are sold as remedies for bunt, should be abandoned in favour of formalin.

II. **Experiments during the season 1921-22.**—The object of these experiments was to test weaker solutions of formalin and also to obtain some information relative to the effect that the presence of whole bunted grains, in samples of seed-wheat treated by the formalin method, might have on the amount of bunt in the resulting crops.

* This *Journal*, Vol. XXVII, 1921, p. 1013.

In the first place it seemed desirable to ascertain whether whole bunted grains could be passed through a drill without being broken up. The following method of testing this was devised: 1,000 bunted grains were counted out and mixed with a gallon of seed free from bunt; this was passed through a drill* and collected. It was then steeped in water, when the bunted grains floated to the top and were collected and counted: 996 of the original 1,000 were collected in this way. A few of these were found burst in the water but this was probably due to water soaking in through slight cracks, as this was found to occur when slightly cracked bunted grains were put into water, but with these exceptions the grains were recovered whole. There appears then to be little danger of bunted grains becoming broken up in passing through a drill of the type used.

The field experiments for 1922 were modified from those of previous years in order to study the effect of deliberately sowing whole bunted grains with the seed.

About 1 pint of bunted grains had been collected from the plots of the previous season's experiment. 90 c.c. of these were measured out into each of 5 glasses; the rest were crushed up with a pestle and mortar and the powder (consisting of the spores of the bunt fungus) was sprinkled over about 1½ bushels of seed-wheat (Standard Red), the whole being mixed together until every grain, so far as could be seen when examining a handful of the seed, had a blackened tuft of hairs at the tip.

Ten separate gallons of this inoculated seed were then measured out, and to each of five of these were added 90 c.c. of the whole bunted grains, *i.e.*, approximately 2 per cent.

The samples were then treated as shown in the accompanying table. The formalin, applied as in previous experiments, was used at strengths varying from 1:320 to 1:800. The plots were sown on the second day after the treatment.

The plots were examined periodically but no difference in the stand could be detected among the plots. At harvest time 1,000 ears were collected from each plot and the number of bunted ears present ascertained.

Since, on the whole, the plots of which the seed contained unbroken bunt grains showed no more bunt than those of which

* The drill used was a Massey Harris No. 5 Disc Drill ("force feed"), set to sow 3 bushels to the acre, travelling at a speed of 2 miles per hour. The machine was operated, for the object of the experiment, by means of a crank turned by hand, so that the machine itself was stationary, thus enabling the passed seed to be collected in a sheet placed below the drill. We wish to thank Mr. C. Davies, Head of the Engineering Department, Wye College, for his assistance in this matter

the seed had none, it is to be assumed that the presence of such grains did not increase the amount of infection; the plots of which the seed received similar treatment are therefore taken together in calculating the percentage of bunt resulting from each treatment.

TABLE II.

Treatment.	*Whole Bunted Grains absent or present (2 per cent.) in the seed.*	*Percentage Germination.*	*Bunted Ears per 1,000.*	*Percentage of Bunted Ears.*
Formalin 1 : 320 ...	(1) Absent	98	0	0.05
	(2) Present	100	1	
Formalin 1 : 480 ...	(1) Absent	99	0	0.05
	(2) Present	99	1	
Formalin 1 : 640 ...	(1) Absent	100	7	0.65
	(2) Present	98	6	
Formalin 1 : 800 ...	(1) Absent	99	17	1.4
	(2) Present	100	11	
Untreated	(1) Absent	97	409	38.95
	(2) Present	100	370	

Discussion of Results, 1922.—The formalin solutions were used at the following dilutions: 1 pint of formalin to respectively 40, 60, 80 and 100 gal. of water. The results obtained, shown in Table II, showed clearly that the formalin became less efficacious the more it was diluted below the 1 : 480 (1 pint to 60 gal.) limit. The presence of 2 per cent. of whole "bunted" grains in the seed produced no increase of disease. The artificially contaminated seed produced in the two "control" plots as high a percentage of "bunted" ears as 37 and 40. In view of the intensity of the disease present its reduction to 1.4 per cent. in the plots where the formalin was used at the extreme dilution of 1 : 800 (1 pint to 100 gal.) is noteworthy, as indicating the efficacy of formalin as a fungicide against bunt. The results show that the use of formalin, diluted 1 : 480 (1 pint to 60 gal.) gives a perfectly satisfactory control of bunt. With formalin at this dilution no possible injury to the seed-wheat is to be feared, *provided that it is applied in the method described below.*

Summary.—1. The old traditional method of "pickling" wheat with a solution of "bluestone" (copper sulphate) should be abandoned. Experiments have shown that a solution of the strength necessary to kill the *spores* of bunt *seriously injures the germination of the seed-wheat.*

2. An easier, cheaper and a safe method of preventing bunt has been discovered in the use of a dilute solution of formalin, applied in the following manner:—

(*a*) The diluted solution recommended for use is prepared by adding one part of formalin* to 480 parts of water. (*e.g.* 1 pint formalin to 60 gal. of water, or for small quantities, 1 fluid oz. to 3 gal., or 1 tablespoonful to 1½ gal.).

(*b*) The diluted solution is slowly sprinkled over the seed wheat at the rate of 1 gal. of solution to 2 bushels of seed. The seed must be moved about and stirred until the grains are all thoroughly wetted, but in no circumstances must the solution be allowed to form pools under the heap in which grains might soak.

(*c*) The seed is then placed in a heap and covered with sacks which have been soaked in the formalin solution; the sacks should be uniformly wet but not dripping.

(*d*) The treated seed is left covered up *for* 4 *hours*, not longer†; then spread out to dry *in a thin layer* on a clean floor; if the floor has been previously used for untreated corn it should be wetted all over with the formalin solution and allowed to dry before the treated seed is spread on it.

(*e*) Precautions must be taken to prevent the re-infection of the treated seed, *e.g.*, sacks which have held untreated infected wheat must not be used for the treated seed unless they have undergone treatment by being soaked in the formalin solution or boiled in water.

(*f*) The treated seed when dry should be sown *as soon as possible.*

3. It would appear that a method involving the immersion of the seed-wheat and skimming off the "bunted" grain, or the use of machinery to secure the same end, is unnecessary.

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* Formalin is the trade name for a 40 per cent. solution of the gas formaldehyde in water. Purchasers should obtain a guarantee that the formalin sold is of the above strength, and see that it is a clear solution free from any precipitate. Formalin needs to be kept in a tightly closed bottle and only freshly prepared diluted solutions should be used, as the gas is volatile.

† In one case, that came to the writers' notice, of injury being caused, it transpired that the farmer had left the treated grain in a heap 18 in. deep from mid-afternoon till the following morning at 6.30.

THE FIRST YEAR'S WORKING OF THE SEEDS ACT, 1920.

The Seeds Act, 1920, and the Regulations made under it have now been in operation for twelve months and there is considerable evidence to show that farmers and others have already benefited. The main object of the Act is to protect the farmer against the danger of unknowingly purchasing and sowing inferior seeds. With this end in view, in the case of a sale of any of the principal farm or garden seeds the seller is required to declare in writing to the purchaser, at or before the time of sale or delivery, certain specified particulars as to the quality of the seeds, such as the percentage germination, percentage purity, presence of injurious weed seeds, etc. Long before the disclosure of these essential particulars was made obligatory by Government action, all the well-known seed establishments made a practice of giving these guarantees, but the distribution of seeds in this country is carried on by a vast number of firms other than the large and better known seedsmen, and it is by bringing these smaller firms into line as regards guaranteeing the quality of the seeds they sell that the Seeds Act is doing good. It is also stimulating the demand for good seed, and so forcing off the market much of the low grade material. The value of seed is insignificant when compared with the cost of labour and of other materials, but the return from all expenditure on tillage depends largely on the quality of the seeds which are sown, hence the value of the Seeds Act in enabling the farmer or gardener to ascertain the quality of the seeds he is sowing.

Licensed Private Seed Testing Stations.—One of the greatest difficulties experienced in administering the Testing of Seeds Order, which was the forerunner of the Seeds Act, arose from the variation in results of tests carried out by different analysts. In order to overcome this difficulty, it was proposed, when the Seeds Act was being drafted, that there should be one central testing station for the whole of Great Britain and Ireland, and that all tests for the purposes of the Act should be carried out at this station. It was hoped that by concentrating at one station the most up-to-date apparatus, in the hands of a highly efficient staff employing the latest scientific methods, it would be possible to place seed testing on a sounder footing in this country than in any other part of the world. This proposal, however, did not find favour in Scotland and Ireland, both of

which countries wished to retain their own official stations. Nevertheless, the Seeds Act is so worded that the establishment of a central official station is still possible.

Once it had been decided to have an official seed testing station for each part of the United Kingdom, it was difficult to withstand the claims of those old established seed firms who had for many years tested their own seed in an efficient manner to be allowed to continue these operations. It was therefore agreed that tests for the purpose of the Act (except in the case of garden seeds) should be allowed at private testing stations, provided that they were licensed for that purpose by the Ministry.

Judging by the experience gained during the past twelve months, the system of having licensed stations is not likely to prove unsatisfactory. Variations in the results of tests occur from time to time, but their number and seriousness have been very considerably reduced.

Sixty-eight private stations in England and Wales have so far been licensed to test, as follows:—All kinds of seeds covered by the Act, 28; all kinds of seed except grass seed, 3; clover, rye-grass, cereal and field seeds only, 1; field and cereal seeds only, 5; field seeds only, 5; cereal seeds only, 26. Except in one case, the carrying out of tests for fees is not allowed in the case of these licensed premises, the privileges being limited to tests for the purpose of the purchase or sale of seeds in connection with the licensee's own business.

Among the conditions affecting these licences is one which requires a portion of every sample tested to be preserved with the necessary marks of identification for a period of three months. A selection of these reserved samples is taken from time to time by inspectors of the Ministry, for check tests at the Official Seed Testing Station. So far, however, remarkably few cases of serious discrepancy have occurred between the results obtained at a Licensed Station and the check tests carried out at the Official Station.

A number of analysts from these licensed stations, and others who hope to qualify for similar posts, have attended a special instructional course during the past summer at the Official Seed Testing Station, Cambridge.

Inspection of Seedsmen's Premises.—Visits to seedsmen's premises are carried out by the Ministry's outdoor staff. The total number of visits paid during the twelve months ended July, 1922, was 11,000, including nearly 5,000 establishments that had not been visited before in connection with the Seeds

Act. Practically the whole of the 5,000 not previously visited were firms where seeds are sold mainly in sealed packets only during a very short period in the spring, entirely as a side-line to the main business of the establishment. They included chemists, general stores, hardware merchants, provision merchants, confectioners, rural post-offices, ironmongers, coal merchants, stationers, fishmongers, fruiterers, barbers, boot dealers, dentists, newsagents, cattle dealers, butter merchants, cycle dealers, tea merchants, drapers and butchers.

It has been suggested that the Ministry's inspectors neglect to visit the small trader of the kind above referred to, but the figures given should disprove such a contention. It must be remembered also that it is much more difficult for the inspectors to discover shops which combine a small seed trade, limited to a few weeks in the year, with another business, than it is to find those establishments where the sale of seeds and kindred material is the principal business.

Control Samples.—The principal object in visiting premises on which seed is sold is to ascertain whether the provisions of the Seeds Act are being properly carried out. With this end in view it is necessary to draw a certain number of control samples for the purpose of having check tests carried out at the Official Seed Testing Station. During the season 1921-22 the number of control samples so taken amounted to 950, including 282 samples of clover, 177 of grasses, 9 of field seeds, 20 of cereals, 15 of roots, and 356 of vegetables. In addition, 280 control samples of sealed packets were taken and also 500 samples of seeds placed in reserve at the licensed private seed testing stations.

The check tests carried out at the Official Seed Testing Station showed that in 97 out of the 950 samples, the declaration as to germination, purity, etc., made by the seller was inaccurate to a marked degree in one or other of the particulars. These discrepancies were mainly in respect of clover, grasses and garden seeds; 12 per cent. of the total number of clover samples; 15 per cent. of the grass samples, and 8 per cent. of the garden samples proving to be incorrectly described.

The principal source of error in the statements made by vendors was in respect of the percentage of germination. In 13 cases the declared germination differed from the results of the official check test by between 10 and 15 per cent. and in 25 cases the discrepancies were over 20 per cent. Ten cases showed a discrepancy of between 3 and 5 per cent. in the percentage

of purity and in 18 cases dodder was found in samples declared to be dodder free.

In addition to the above, 76 of the control samples taken were of seeds in connection with which no declaration whatever was being made. In the majority of these cases, however, the check test showed the seed to be of good average quality.

It is impossible to draw general conclusions from the results of the check tests on control samples as the figures are not strictly comparable with those of the previous season on account of the fresh ground broken by the inspectors. It is satisfactory to note, however, that in spite of the fact that a large number of "new" premises were visited, the number of control samples that it was considered desirable to take was considerably fewer than last season, and that the proportion of these control samples which were shown by the check test to be wrongly described by the vendors was only 2 per cent. in excess of last year's figure. Control samples are taken as a rule only in cases where the declaration of the vendor is suspected to be inaccurate.

In all cases where the check test showed a marked discrepancy from the vendor's particulars, the matter was taken up with the person concerned, and in practically every instance the action of the Ministry resulted either in the seeds being destroyed or returned to the firm from which they were purchased, or in the seller adopting the official test as the basis of his declaration in further sales.

Packeted Seed.—As already indicated, one of the most helpful features of the Seeds Act is the effect it is having in regulating the sale of seeds in small packets. It is well known that, in the past, large quantities of seeds, the age and germination of which left much to be desired, were sold in this manner.

Many small shopkeepers purchase a stock of packeted seed which is offered for sale during the sowing season year after year, until the supply is exhausted. As a result, much of this is of very poor germination by the time it comes to be sown by the unfortunate purchaser.

This practice is now prevented by the Seeds Regulations which require a statement to be delivered to the purchaser of packeted seed showing the percentage of germination and purity, the date of testing, and the season in which the seeds were packeted, etc. It cannot, of course, be claimed that the sale of poor quality seeds in packets has been stopped during the short period that these regulations have been in force, but there is evidence to show that an improvement has been effected, and

it is anticipated that the grading up process will continue, as more experience is gained.

During the 1921-22 season, the Ministry's inspectors discovered a large number of cases in which, owing to ignorance of the Regulations, the necessary particulars were not being declared by the seller. Steps have now been taken to visit the many comparatively small wholesale packeters who supply the packets to the small shopkeepers, for the purpose of explaining to them the provisions of the Regulations as affecting themselves, and as affecting the retailers to whom they sell their stocks of packets. The beneficial result of these visits is already apparent.

During the season 270 control samples of packeted seed were taken. The result of the check test on these samples showed that 83 per cent. were seeds germinating at or above the minimum prescribed in the Seeds Regulations; 10 per cent. germinated below the minimum but above two-thirds, and 7 per cent. were below two-thirds. The corresponding figures for the season 1920-21 were 81 per cent., 13 per cent., and 6 per cent. respectively.

(To be concluded.)

* * * * * *

REDEMPTION OF TITHE RENTCHARGE BY ANNUITY.

(1) **The Advantages of Redemption.**—It is generally agreed by both landowners and titheowners that the redemption of tithe rentcharge on reasonable terms is desirable. Redemption saves the landowner the trouble of verifying the accuracy of the demands sent to him half-yearly by the tithe collector and of having to remit the payments for sums which, in many instances, are very small. It also removes a possible cause of complication and delay in sales and other dispositions of land.

The chief advantages of redemption to the titheowner are that it saves him the cost of collection, which in some parishes is considerable, obviates a frequent cause of ill-feeling and litigation and extinguishes the tithe rentcharge for all purposes including the payment of rates and land tax, and thus relieves him of the necessity for taking steps from time to time to obtain a re-assessment of the tithe rentcharge for the purposes

of rating and taxation. It is not, however, always convenient to landowners to find capital sums for the redemption of tithe rentcharge on their lands, even though capital moneys are under the Settled Land Acts applicable for such purpose, and to meet such cases the Tithe Act, 1918, provided facilities for landowners to redeem by annuity.

(2) **Calculation of Redemption Annuities.**—By agreement between the landowner and the titheowner under the Act the consideration for redemption may be discharged by an annuity payable yearly or half-yearly for a period not exceeding 50 years. Section 4 (2) of the Act provides that the amount of the annuity shall be calculated in the following manner:—To interest not exceeding 5 per cent. per annum on the consideration money is to be added such sum as would be sufficient, if the periodical payments thereof were accumulated at compound interest at a rate not exceeding 4 per cent. per annum, to produce an amount equal to the consideration money at the end of the said period. The total of these two sums will give the amount of the yearly or half-yearly payment of the annuity as the case may be.

In any such case the Minister by order charges the land with the annuity, and the order contains provisions for giving effect to the charge and for protecting the interests of persons interested in the rentcharge.

(3) **Consents necessary to Redemption by Annuity.**—Under Section 4 (3) of the Tithe Act, 1918, however, no such agreement for redemption by annuity is valid:—

(*a*) If made by a spiritual person entitled in respect of his benefice or cure except with the consent of Queen Anne's Bounty; or

(*b*) If made by a person (not being a spiritual person so entitled) who is not empowered to sell the rentcharge unless he obtains the consent of some other person, except with the consent of that other person.

(4) **Redemption by Annuity of Clerical Tithe Rentcharge and Welsh Tithe Rentcharge.**—The Ministry understands that Queen Anne's Bounty will, as a rule, be prepared to consent under certain conditions to the redemption of any tithe rentcharge or tithe rentcharges amounting in all to not less than £1 payable by a landowner to an incumbent, and to advise the incumbent to agree to the same. The Ministry also understands that the Welsh Church Commissioners, who own over £200,000 tithe rentcharge in Wales and Monmouth, will, as a rule, be ready to agree to applications for redemption by annuity of any tithe rentcharge payable to the Commissioners.

(5) **Former Objections to Redemption by Annuity now removed.**—When the Tithe Act, 1918, was passed the following objections to redemption by annuity under that Act were urged:—

(1) There was no statutory power whereby redemption annuities could be apportioned except under the almost unworkable provisions of Sections 10 to 14 of the Inclosure Act, 1854, so that owners of land upon which redemption annuities were charged were in a position of considerable difficulty when they came to sell portions of the land.

(2) There was no statutory power under which the landowner could, if he thought fit, compel the redemption of a redemption annuity on fair terms.

(3) Where land was held in settlement, capital moneys belonging to the settled estate could not be applied in payment of the sinking fund portion of the annuity and consequently the tenant for life or other limited owner of the land who redeemed by annuity was liable, not only for the interest on the consideration money for redemption which might be said to take the place of the annual tithe rentcharge payment, but also for the sinking fund payment which was really capital outlay.

These objections have now been partially met by the Tithe Annuities Apportionment Act, 1921, and the position will be further improved when the Law of Property Act which has just been passed comes into force, *i.e.*, on the 1st January, 1925.

(6) **Apportionment of Redemption Annuities.**—Facilities for the apportionment of redemption annuities were provided by the Tithe Annuities Apportionment Act, 1921. Under Section 1 (1) of this Act an application for an order for such an apportionment can be made to the Ministry by any person interested in the land charged or any part of it without the concurrence of any other person. Section 1 (2) empowers the Ministry, on the application of an interested person, to require as a condition of making the order that any apportioned part of the annuity which does not exceed the yearly sum of £2 shall be redeemed forthwith.

(7) **Redemption of Redemption Annuities.**—When the Law of Property Act comes into force, *i.e.*, on the 1st January, 1925, any person interested in the whole or any part of the land affected by a redemption annuity will be empowered, without the consent of the annuitant or any other person, to free his land from the annuity by redemption under Section 92 of the Act, which amends Section 45 of the Conveyancing and Law of Property Act, 1881.

(8) **Settled Lands.**—Section 2 of the Act provides that Section 21 of the Settled Land Act, 1882, which sets out how

capital money arising under that Act may be applied, is to have effect as if the modes of such application of capital money included the discharge, purchase or redemption of any apportioned part of a tithe redemption annuity charged on the settled land or any part of it, or the discharge of such part as does not represent interest (*i.e.*, the sinking fund portion).

Section 64 (1) (iv) of the Law of Property Act provides in effect that in addition to the modes authorised by Section 21 of the Settled Land Act, 1882, capital money shall be deemed always to have been capable of being applied in the purchase or discharge of an annuity charged under Section 4 of the Tithe Act, 1918, on settled land or any part thereof or in the discharge of such part of any such annuity as does not represent interest.

It will be observed that these provisions of the recent Act supplement the provisions of Section 2 of the Tithe Annuities Apportionment Act, 1921, and authorise the application of capital money arising under the Settled Land Acts to unapportioned annuities. It is also to be noted that though the Law of Property Act does not come into operation until 1925, the provisions as regards the application of capital moneys of settled estates to the purchase or discharge of an annuity or to the discharge of the sinking fund portion of an annuity when they come into operation will be retrospective.

(9) **Preliminary Steps for Redemption by Annuity.**—It seems not improbable that the alterations in law above referred to may induce many persons interested in settled lands who have hitherto hesitated to redeem by annuity to consider whether they should not now take steps to avail themselves of the facilities now provided for that purpose.

Landowners who desire to redeem by annuity the tithe rentcharge owned by incumbents of benefices should, in the first instance, communicate with Queen Anne's Bounty, 3, Dean's Yard, Westminster, London, S.W.1.

In other cases it will usually be convenient for the landowner to make application for redemption to the Ministry in the usual form No. 157/L.T. in the first instance. He should at the same time send to this Office the usual search charge, which is 5s. if the property does not exceed 10 acres, 10s. if it exceeds 10 acres but does not exceed 30 acres, and a further 5s. for every additional 30 acres or part of 30 acres. For example, if the area included in the redemption is 300 acres

this preliminary charge will be 10s. plus nine times 5s., *i.e.*, £2 15s. 0d. The amount thus paid will be credited to the applicant as part of the office fee, calculated in accordance with paragraph 19 of the Ministry's Instructions for Redemption, Form No. 261/L.T., which will eventually be payable by him before the order for redemption is made.

On receiving such an application the Ministry will, in the case of tithe rentcharge payable to the Welsh Church Commissioners, communicate with the Commissioners as regards the amount of the annuity, and subsequently notify the same to the applicant for his agreement. In cases where the tithe rentcharge is not owned either by an incumbent or by the Welsh Church Commissioners, the Ministry will itself suggest to the applicant for redemption what, in its opinion, would be a reasonable amount at which to fix the annuity and request him to communicate with the titheowner with a view to obtaining his agreement to the same, if possible.

(10) **Redemption by Lump Sum does not require Consents.**—Where redemption by a lump sum is proposed it is still possible for the landowner to redeem without the consent of the titheowner or any other person. In the absence of any agreement as to the amount of the consideration money, the Ministry determines the amount in accordance with the First Schedule to the Tithe Act, 1918, the provisions of which are explained in paragraph 4 of the Ministry's Instructions for Redemption No. 261/L.T.

(11) **Redemption where Land has been taken for Public Purposes.**—Under Section 1 of the Tithe Act, 1878, as amended by the Tithe Act, 1918, it is provided that where land charged with tithe rentcharge is taken for any of the following purposes, viz.:—

The building of any church, chapel, or other place of public worship;

The making of any cemetery or other place of burial;

The erection of any school under the Elementary Education Acts;

The erection of any town hall, court of assize, gaol, lunatic asylum, hospital, or any other building used for public purposes, or in the carrying out of any improvements under the Housing of the Working Classes Act, 1890;

The formation of any sewage farm under the provisions of the Sanitary Acts, or the construction of any sewers, or sewage works, or any gas or water works;

Or the enlarging or improving of the premises or buildings occupied or used for any of the above-mentioned purposes;

the person or persons proposing to carry out the above-mentioned works, buildings, or improvements, shall apply to the Ministry to order the redemption of the tithe rentcharge.

Representations have been made to the Ministry that the provisions of this Section are frequently disregarded by the landowners concerned. There may, perhaps, have been some justification for this before the passing of the Tithe Act, 1918, when the consideration money for redemption had to be calculated on the basis of 25 years' purchase of the par value of the tithe rentcharge. Now, however, that it is possible to redeem on equitable terms it is desirable that in all cases to which the Section applies application for redemption should be made forthwith.

(12) **Redemption of Corn Rents.**—The provisions relating to tithe rentcharge referred to in the foregoing paragraphs substantially apply also to corn rents, rentcharges, and money payments (other than rentcharges payable under the Extraordinary Tithe Redemption Act, 1886) which are liable to redemption under the Tithe Acts, 1836 to 1891.

(13) **Forms.**—The following forms will be supplied on request:—

(*a*) Instructions for the redemption of tithe rentcharge and corn rents, etc., in cases where the application is made by the landowner (Form No. 261/L.T.).

(*b*) Application for the redemption of tithe rentcharge in such cases (Form No. 157/L.T.).

(*c*) Application for the redemption of corn rents, etc., in such cases (Form No. 204/L.T.).

(*d*) Forms of continuation schedule for use in the redemption of tithe rentcharge or of corn rents, etc., in cases where the schedule provided in the form of application is not sufficient to show all the rentcharges proposed to be redeemed (Form No. 133/L.T.).

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THE MAKING OF CLOGS, CLOG-SOLES AND CLOG-BLOCKS.

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IN the year 1337 a number of Flemish clothiers and weavers settled in Bolton, Lancashire, and the weavers brought with them their sabots or wooden shoes. The sabots were made entirely of wood, with lamb-skin linings to protect the feet. Wooden

shoes are known to have been worn in London earlier than the 14th century, and may have been used in other parts of the country, but they were new to Lancashire.*

Clogs are wooden shoes with leather uppers, and pattens have rings of iron to keep the shoe off the ground. No kind of foot-gear could keep the feet warmer and dryer on wet ground, and they are reputed to protect the women who work in the Lancashire weaving sheds, which have damp floors, against rheumatism and other ills. Clogs are worn extensively in Lancashire, West Yorkshire, and in neighbouring counties, by men, women and children. They are useful for dairy-work, both on the farm and in the cheese-factory, and are admirable for gardening, poultry-keeping or other work that involves standing or walking in wet places. Fashion has done ill-service to workers and children by decreeing that boots, however poor in quality, are smarter to wear than clogs. Clogs have light grooved irons underneath the edge of the sole and heel to make them wear better. A piece of leather is sometimes nailed on the sole within the irons to deaden the clatter which is apt to provoke merriment in districts where they are unfamiliar. Compared with thick boots they are not unduly heavy. The uninitiated would suppose that a rigid wooden sole would be most uncomfortable; but the clogs are large enough for the foot to have freedom inside, and they depend upon the buckled flaps or laces that meet over the ankle to keep them on. There are several types, the "Lancashire" being distinct from the "country," and considered to be smarter wear owing to the slightly pointed toe, which would be most uncomfortable unless extra length were allowed. "Country" clog wearers desire no such decorative style.* It has been said that the habitual wearing of clogs from childhood checks the development of certain muscles at the back of the leg, and that clog-wearers may be known by their rocking walk as though they had runners or rockers on their feet. Shoes or slippers, however, could be procured for summer and indoor wear and for running about at games, while clogs are greatly to be preferred to the cold and sodden boots that must often be worn by children who can have only one pair at a time.

Kind of Wood Used.—Alder wood is preferred to any other for making clog-soles. It is so scarce that gangs of clog-block cutters visit the districts where it grows, sending off the roughed-out pieces of alder to the northern counties where clog-soles are fashioned from the blocks. The scarcity of material is no new

* From "A Short Sketch of the Clog and Patten Trade," by Alderman Broughton, published by the Amalgamated Society of Master Cloggers.

difficulty. In the year 1456 the Clog and Patten Makers made a pitiful appeal to the King to be allowed to use such pieces of "tymber of Aspe" as would not serve to make arrows. Their petition appears to have been granted for the time being, but in view of a projected invasion from France, the restraint on the use of this timber was again enforced on the clog-makers.

The "Aspe" timber is a kind of poplar, extensively grown on the Scotch hills but seldom used by cloggers at the present day. Birch is sometimes used, but alder makes the most comfortable clogs and is less apt to split than beech which is also sometimes used. The hand-made alder soles are preferred in Lancashire to the beech soles made in factories. Machinery is of fairly recent introduction and improvements are expected which will cause the machine-made soles to compete more effectively with the hand-made. It is also rumoured that ready-made soles may be sent over from the virgin woods of North America. By this means greater economy in transport than the English clog-block cutter can secure will be effected through leaving the waste material behind. He goes to the woods to work, selling his waste as firewood if he can, and burning up the small chips in his own fire. The clog-block, though it is cut to definite sizes for children's, women's and men's clogs, still has to be reduced greatly by the clog-sole maker to whom it is sent. His yard becomes littered with growing piles of chips as he cuts away at the blocks. It is said that three-quarters of the blocks are cut to waste. This illustrates the truth that wood-industries should not be isolated, disconnected crafts, but that the waste or parts less suitable for one craft should be passed on to be used for some other purpose with as much economy as possible in time, material, skill and transport.

The interdependence of various wood-trades is also illustrated by the fact that alder and birch are used both for broom-heads and for clog-soles. A Devonshire wood-dealer whose principal trade is in firewood, sets turners to make broom-heads and clog-block makers to cut clog-blocks out of material sorted for each purpose.

Cutting the Blocks.—The birch and alder, chiefly alder, is bought where it can be obtained in fairly large quantities, either felled or standing in the woods. The price is a matter of arrangement with the owner of the woods, who will often give credit until the returns from the finished clog-blocks come in. This makes it easy for a workman to become a master, as capital is only required for paying labour and board. During the War,

when demand was keen and prices were high, many workmen established businesses for themselves. For the roughest work of felling and sawing labour is often hired on the spot, but for the actual clog-block cutting skilled workers are employed who travel in gangs of six or seven. The system is the same as that in the timber trade when gangs are sent out to fell trees. Before the War, a Shropshire timber-merchant and clog-block dealer employed some twenty-five to thirty clog-block cutters. They travelled from place to place in various parts of the country, Salisbury, Oxford, Thetford and Southampton being amongst the places mentioned by this Shropshire merchant. Thus it sometimes happens that a travelling clog-block cutter settles down in a district where alder flourishes and sends off his blocks to former employers or other acquaintances in the trade. Some of the clog-block dealers who are settled in the south and west of England may be known by their speech and enterprise as North-countrymen.

The tree or pole after being felled is sawn into fixed lengths of four sizes, for men, women, boys and children. If the wood is knotty there is more waste, and only the smaller sizes can be cut. These lengths are then placed on wooden block supports and cut into shape with a special tool. This is a knife made of one piece of steel about 2½ ft. in length, bent to an obtuse angle in the middle, the lower half forming a blade about four inches deep and terminating at the end in a strong hook. This secures the knife to a wooden block driven firmly into the ground. This block forms one of the two supports of a low bench on which the piece of alder is placed and the knife is worked as on a pivot. The cutter grips it with his right hand by a wooden handle at right angles to the steel, stooping, and cutting downwards with remarkable certainty and rapidity, while he holds and moves the clog-block with his left hand. The cuts are made at angles, and the block trimmed with an axe, so that it represents very roughly the final shape of the clog-sole. The blocks are then stacked to dry in bee-hive shaped heaps as high as a man can reach, built as peat-ruckles are built with air spaces between the blocks. When a truck-load of blocks is ready, it is sent off to Lancashire.

Not a Whole-time Trade.—An employer did not consider that pre-war earnings yielded a "living wage" but the men are paid by piece-rates and their earnings vary with their skill. The clog-block trade is not carried on by itself, for the masters, and probably the men too, require some other source of income.

For example, a Shropshire employer is a timber merchant and keeps a small inn, and an employer in Devonshire is a firewood dealer who also has a small wood-turning industry, making brush-stocks. The former sends gangs of cutters near and far; the latter, as yet in a small way of business, had employed a single cutter until others had learnt the art, and is only using wood obtained near at hand.

No evidence has been found in the three counties under investigation (Shropshire, Staffordshire and Cheshire) to show that the separate trades of the clog-soler who cuts the block to the final shape, and the clog-maker who makes and fixes on the uppers, are rural industries. The cloggers are often cobblers as well and they are to be found in the towns. They buy the soles and attach uppers which are frequently made from old boots.

Two very interesting cloggers were found in a country town in Shropshire, and their business proves that clogging still survives as a complete self-contained craft. Of these two, one has sons in the trade and the other has not. Material is obtained in the neighbourhood, for present railway freights are prohibitive to a small-scale business. Even on local wood haulage costs have been high. One of the cloggers, who would like to get his supplies close at hand, estimates that £100 a year could be made from four and a-half acres of waste land near by if it were planted with alder. Some alder can be cleared by thinning every five years in such a way that other shoots grow strong, but the best material for clogs comes from wood of twenty-five to thirty years' growth. The clogger held out his hand, palm upward, with the thumb and fingers bent to show how five alder shoots should be left to grow out from the stock and then shoot up straight and strong. He does not care for older material as there is more sawing and cutting to be done to it, and consequently the costs are higher.

The son, who cuts the blocks and does a sawing and clearing business for fences and firewood, prefers to work in his own shed at home and not out in the woods. Therefore the problem of waste wood, on which haulage to the yard has been paid, is seriously exercising his mind. He is thinking of toys and other small wooden articles. He does not use the usual block-cutter's knife when working at home, but shapes the blocks with his saw, which is worked by means of a small engine, after they have been cross-sawn and cleft to the right size. He is also considering a small portable saw which could be used out in the woods, and is interested in engines whose furnaces can utilise chips and saw-

dust as fuel. All their wood is cleft, the saw only being used for cross-sawing and trimming the cleft pieces to the correct shape for clog-blocks. Straightness of grain is important in this trade, and cleaving secures this.

Making the Soles.—The sole-making is done with a tool similar to that used for block-cutting. The craftsman seems to know by heart the exact curve that is needed for comfort, and with very little measurement is able to make the right shapes for every size in clogs. Some clog-makers get leather for the uppers from the mills; it is strong, thick and supple, and impregnated with oil, which makes it soft and weather-proof. The leather is in wide strips which have been used to cover rollers in the mills. Once it has worn a little thinner in one part than in another, it must be removed from the rollers, which must be exactly cylindrical; it can therefore be had cheaper than new leather and the thin parts can be cut away. A stretching machine is used to shape the leather so as to give the necessary spring for the instep. The uppers are made in two pieces only, a third piece inside giving strength to the heel. They are sewn together with a sewing machine, such as boot-repairers use, and when the upper is nailed to the sole, and the irons and fastenings are put on, the clog is complete. Some clogs are lined with felt.

The Outlook.—Cloggers are very scarce, as no boys have been learning the trade. There was an abnormal demand during the War, when no foreign clogs were coming in, and this appears to have stimulated the use of machinery. Demand fell off somewhat during the latter part of the War, when boots were worn owing to higher wages, and the trade appears to be feeling the general depression at the present time.

There is said to be an opening for small clog-making enterprises in the south of England, where clogs are not unknown, and might, it is thought, be popularised if light, comfortable types were put on the market and the retailers induced to stock the irons for replacement when worn out. This lengthens the life of the clogs and makes them all the more economical in comparison with boots. The irons and buckles can be procured from Lancashire and would probably not be worth making locally, but a small clogging firm would have to include a wood-dealer who would be responsible for felling the wood and preparing the clog-blocks, a skilled clog-sole maker, and a boot-maker or repairer who could make and fasten on the leather tops. Such a partnership would probably be the best means of working up a local

"bespoke" retail trade with customers who like their footgear made to measure. A man might have a good chance of working up a small local trade, but he could not increase it largely without meeting competition from machine-made and imported clogs. His success would depend on (1) real superiority; (2) economies effected by getting local alder made up locally, which would otherwise go north as clog-blocks and come south again as clogs; and (3) facilities for getting suitable leather on special terms. It is not thought that clog-sole machinery would be worth introducing into a small concern, and there is no reason to suppose that a big industry would pay.

The presence of clog-block cutters in alder-growing districts would be a helpful factor in launching small experiments, since the cutters or their employers are in touch with other branches of the industry. It would not be impossible to provide the essential safeguard for men undertaking a new venture; that is, to see that they have some alternative outlet in case of decline or failure in the trade. This could be done by connecting the industry with wood-dealing and other wood-crafts and perhaps also with boot-repairing. The small-scale craftsman can rarely afford to be a "one-job" man. Clog-solers are reputed to be scarce because during the War they were wanted out in the woods and did not care to settle down again to indoor work. Probably their real reason was the competition of machine-made clogs which drove them away from their former occupation.

There is a tendency for skilled journeymen to move away from areas where machinery is displacing their special craft, and to set up small businesses in some remote or rural district for a market in which competition from the machine-made product is not acutely felt. It may or may not be a local market, but it is a special market in which their specialised skill, or personal qualities, have value. It may, for instance, be a retail trade, in an article of distinctive quality, made under conditions in which the compensating advantages of personal skill and of any economies in getting the small lots of material near at hand, balance the advantages of big-scale production and wholesale distribution.

FOOD IN RELATION TO EGG PRODUCTION.

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In the economics of egg production, the relation that feeding costs bear to the total cost of production on one hand, and what relation the cost of food bears to the value of the output of the birds, always excite attention. It has become almost a truism to say that feeding costs taking the year through should not exceed the price of one egg per week, nevertheless it is difficult to find satisfactory data on which such an opinion can be based.

The soundness of the opinion cannot be doubted, but it obviously opens up questions that must be explored in the immediate future, if the industry of commercial egg production is to be continued successfully. The suggested limit of feeding costs depends on two factors, the price of feeding stuffs and the price of eggs. Both factors are variable and liable to have their relationship materially altered by developments that are already making their influence felt.

We have two well-defined schools of thought. On the one hand we have those who by reducing production costs, feeding of course being part, look for an increased profit on a comparatively low egg-yield per bird, and we have those who are prepared to spend more on production and recoup themselves by a higher egg-yield.

So far, no detailed figures seem available showing the cost of production per thousand eggs, on a plant running successfully with a low average egg production. It follows that if the plant is successful on a low average, production costs must have been cut rather heavily to show a profit at all, and the feeding costs will have been cut with the others. In the absence, however, of records of the system we are bound to approach the question of feeding costs from the opposite angle, that is from the point of view of comparatively high feeding costs, on a high flock average.

In passing, however, it might be as well to point out that low feeding costs do not necessarily result in a low flock average. Our knowledge of food stuffs is incomplete, and it is by no means certain that through comparatively high priced grain and milling offals lies the only way to feed the necessary food elements to laying hens. In more than one case, individual breeders have availed themselves of unconventional food due to cheap local supplies, without damage either to the birds or their produce.

When we approach feeding costs in relation to egg production from the point of view of high flock average, we have the figures extending over three years of The Harper Adams College Laying Trials, which are summarised on the accompanying diagram. Before proceeding to deal with the costs in detail, it might be as well to answer one or two criticisms that have been urged against them.

In the first place it is claimed that the feeding cost per bird is unduly high. This is not denied, but the point of view from which these figures should be approached, must be that of poultry keepers and not the wholesale millers. The prices given month by month do not represent so much the actual price paid for the food, as the price at which small poultry keepers locally were buying the foods used during the same period. The difference between the two levels of prices when worked out to cost per bird, would only be a fraction of a farthing, but expressed as price per ton is a much more considerable item.

It has also been stated that the feeding costs are high because the foods used were unduly expensive and that cheaper substitutes could have been found. The main purpose of the Laying Trials, however, is to get the maximum output in a definite period, a very different problem to getting the maximum output on the minimum cost. To let any outside consideration affect the question of immediate output, would be foreign to the purpose of the trials. The birds have to demonstrate their ability as producers between 1st November and 3rd October of the following year, and in fairness to the breeder concerned no question of experiments with feeding ought to be considered.

The accompanying diagram gives the average feeding cost and the average output per bird during the last two years' trials and their relation can be seen at a glance.

This chart of comparative values is interesting as showing that there is a relation between feeding costs and the value of eggs produced. A sharp rise in both values is experienced from the beginning of November until early in January, after which there is a continuous drop until low values are reached in the early spring [illegible] summer, and the curves do not recover, until November again comes along.

But this must not be pushed too far. Although this factor has become a regular feature since these feeding costs were first compiled three years ago, it may be due to the nature of the trials. Although the value of food increased during this period, the actual weight consumed was normal. It is obvious that the rise

in egg values is due to scarcity during the winter, and in all probability the rise in food values for the corresponding period is due more to a personal, than an economic factor. The poultryman in charge of the trial was in all probability feeding heavily the more expensive foods, in order to get his output quickly up to its maximum, and just to what extent this personal factor comes in, it is impossible to say until the conclusions arrived at by the study of these figures can be checked by experimental work on a commercial basis. But it must be very obvious that if, while maintaining the high curve of egg values, the corresponding curve of food value could be flattened to its summer level a very material difference would be made in the profit. While a few pence per bird is not a great item taken by itself, it becomes so when spread over 740 birds, or as will be the case this year, nearly two thousand.

A study of comparative weights shows that while values are related weights are not. The heaviest feeding weight does not correspond with the greatest output.

But interesting as the study of comparative values and weights may be, there is a further aspect of feeding for egg production that should not be lost sight of. In the "Feathered World Year Book" for 1921 the writer called attention to the relation that exists between quality of food consumed and the actual output of eggs. There can be little question that quality of food is closely related to output, and it is interesting to notice from the accompanying diagram, that during the years when the quality of food was at its worst, the output of eggs per bird was also the lowest registered. The same thing holds true of the percentage of second grade eggs to first. The poorer the food became the more second grade eggs were recorded, as will be seen from the following table:—

Summary of Second Grade Eggs during four Winter Months.

	1915-16.	*1916-17.*	*1917-18.*	*1918-19.*	*1919-20.*	*1920-21.*
1st Grade	66·1	51·8	54·1	72·92	77·3	75·69
2nd Grade	33·9	48·2	45·9	27·08	22·7	24·31

There is one aspect of feeding costs in its relation to production that has not yet been dealt with. It is a mistake to assume that eggs alone represent the output of value from any given pen. In the growth of flesh and in the production of manure we have two items less by far in value than the eggs, but still considerable, to set off against the food and other costs. While flesh and manure are usually disregarded in working out values it is obvious they should be included. Even at the end of

a season of heavy laying, some of our dual purpose breeds will show an increase in carcass weight, and consequently a higher killing price would be obtained. Similarly the manure produced if properly stored and used is a most valuable commodity, and its value should certainly be credited to the pen performance. An ordinary pen, fed as the Harper Adams Laying Trial birds are fed, will produce a quarter of a ton of manure per annum showing the following approximate analysis:—water 72·6 per cent., nitrogen 1·42 per cent., phosphoric acid 2·01 per cent., potash 0·42 per cent. Expressed another way each pen of six hens competing at the trials, produces roughly between 7 and 8 lb. of nitrogen, 10 lb. of phosphoric acid and 2½ lb. of potash. When it is remembered that this year the birds may be expected to produce nearly one hundred tons of this highly concentrated manure, to disregard it in relation to feeding costs appears to be a mistake. The unsatisfactory state, in which the storage and use of poultry manure is at present, opens up another question outside the scope of this paper.

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A NEW APPLE PEST.

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A REPORT has recently become current in horticultural circles of the appearance in England of a weevil allied to the Apple Blossom Weevil but even more destructive in its habits, and it may therefore be of interest to *Journal* readers to give a few details with regard to the discovery.

In the spring of 1921 Mr. F. R. Petherbridge, of Cambridge (Adviser to the East Anglian Province) found on the borders of Norfolk one or two weevil larvæ resembling those of the Apple Blossom Weevil, but feeding in the unexpanded leaf or truss buds of apple and not in the actual blossom buds themselves. As soon as one of these larvæ, after pupating, had turned into an adult weevil, it was evident that a species different from the Blossom Weevil had been obtained. In August of the same year Mr. Harwood, when collecting beetles in Kent, obtained under bark in company with Apple Blossom Weevils an example of the same kind of beetle as had previously been reared by Mr. Petherbridge. Both the Kent and Norfolk specimens have since been identified as a species of weevil (*Anthonomus cinctus*, Kollar, =*A. pyri*, Boh.) not previously recorded in Great Britain and therefore of course without any English name.

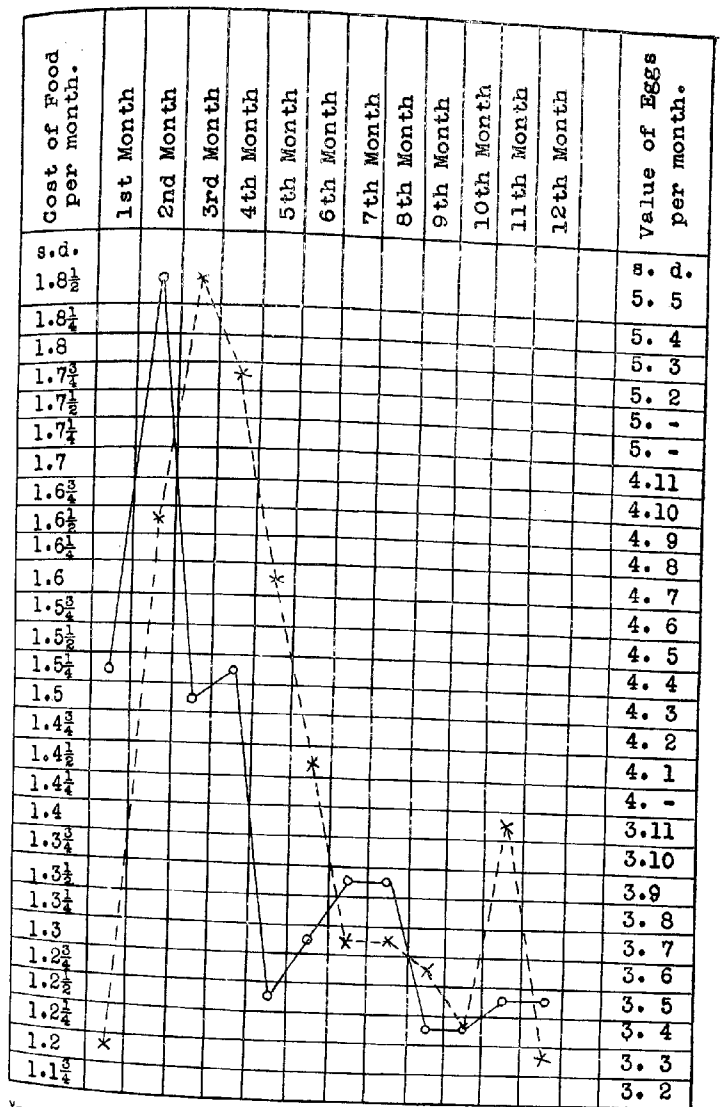
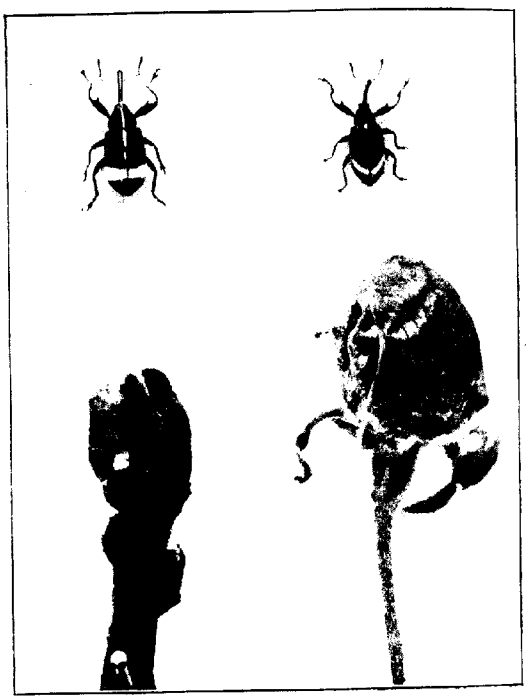


FIG. 1.—Average Values of Eggs produced and Food consumed. November, 1919, to October, 1921.



1.—Bud Weevil.
2.—Apple Bud from which a Bud Weevil has emerged.
3. Blossom Weevil.
4.—"Capped" Blossom from which a Blossom Weevil has emerged.

This new weevil, which might perhaps be known as Bud Weevil to distinguish it from the Blossom Weevil, has been familiar on the Continent of Europe for very many years as a pest of pears and to a less extent of apples. In France the insect is called the Pear Anthonomus and also the Winter Worm. In Germany it is known as the Pear Bud Killer or Pear Bud Stinger, while there are also records of its doing considerable damage both in Russia and Italy. In all cases it would seem to be pears which are damaged rather than apples. In comparison with the Apple Blossom Weevil, the pest usually appears to be regarded as of less, and sometimes as of much less, importance. It is of course quite impossible to predict the nature of the losses which it may ultimately cause in Great Britain, while it is almost equally difficult to judge whether the species is really new to our orchards or whether it has persisted for years in small numbers undetected. It is undoubtedly the case that it might easily be carried in the egg stage upon nursery stock from the Continent, and that nothing short of complete prohibition of the entry of such stock could prevent its introduction. On the other hand, if it were a recent arrival in England, it is decidedly unlikely that it would appear simultaneously in two localities so far apart as Kent and Norfolk, and on the whole it is more probable that the insect has been present with us for at all events a number of years and that it may even be native.

In regard to the life history of the new weevil, it is recorded in Germany that eggs are laid in September and October in the leaf and fruit buds of pear trees, that the larvæ are found in the buds from the middle of February and that they pupate at the beginning of May, the beetles emerging from 8 to 10 days afterwards. It is further stated that the beetles appear to "sleep" during the summer and not to reappear until the time for egg-laying in the following autumn. Judging by the behaviour of specimens which were kindly supplied by Mr. Goude (Horticultural Instructor for Norfolk), these statements correspond fairly well with the habits of the insect in Great Britain, and there is every reason to suppose that it will have a similar life history here. Mr. Petherbridge, however, is investigating the matter and may shortly be able to confirm or correct these notes.

In the meantime, it is suggested that pear and apple growers should be on the look out at the end of winter and early spring for buds which have been killed or have failed to expand, and if on examination they are found to contain grubs, the Ministry would be grateful for full particulars.

A LOCAL INVESTIGATION OF THE FOOD OF THE LITTLE OWL.

WALTER E. COLLINGE, D.Sc., F.L.S.,
Keeper of the Yorkshire Museum, York.

ON the publication of my report on the food and feeding habits of the Little Owl,* I received a letter from Mr. M. Portal inquiring if I would like to have specimens of this bird from a series of localities in Hampshire from the end of May to the middle of July. Mr. Portal was of opinion that the critical months were June and July "when one might have wished for 50 instead of 22 and 14 specimens for investigation." Mr. Portal's kind offer was accepted and he thereupon made arrangements with the owners and keepers of several estates. In all 98 birds have been received from different localities. Of these 2 were received in May, 39 in June, and 55 in July. In two cases the stomachs were empty, and are therefore not included in these figures. Specimens have been received from 27 different estates, or an average of 3.63 from each.

In considering the results obtained it must be borne in mind that this is a purely local investigation, and as Dr. Ritchie has pointed out,† if we limit the area covered by any one study of the food of birds, "the farmer in any particular locality begins to see that the statistics of the laboratory have some close relation to the facts which force themselves upon his notice throughout the year," and he will "begin to put faith in the conclusions drawn from necrological surveys." That the value of such local investigations is considerable probably no one will deny, but the danger is that those who read the results of such will jump to the conclusion that these are typical of the particular species of wild bird throughout the whole country, whereas they only indicate the feeding habits of the species in a limited area, and such habits are modified or vary according to the particular nature of the locality, *i.e.*, whether agricultural, horticultural, game-breeding, moorland, etc. In Hampshire and the surrounding district there is a large quantity of game-birds bred.

Food of the Adult.—Of the total bulk of food consumed by these 98 specimens during May, June and July, 91.57 per

* *Journal of the Ministry of Agriculture*, Feb., 1922, p. 1022, and March, 1922, p. 1133.

† *Scottish Naturalist*, 1918, p. 255.

cent. consisted of animal matter, and 8.48 per cent. of vegetable matter. Of the animal content 57.84 per cent. consisted of insects, 20.28 per cent. of earthworms, 7.71 per cent. of voles and mice, 2.94 per cent. of wild birds (mostly house-sparrows) and 1.78 per cent. of game birds and poultry.

Wireworms and click beetles constituted 10.10 per cent. and cockchafers and their larvæ 5.10 per cent. of the insect content. The neutral insects consisted in the main of Dung Beetles (Geotrupes) and a few small moths.

Monthly Percentages of the Principal Food Items of the Adult Little Owl.

Kind of Food.	May.	June.	July.	Average.
Seeds of Weeds	—	·14	—	·05
Miscellaneous Vegetable Matter ...	—	16·15	9·00	8·38
Slugs or Snails	—	·12	—	·04
Injurious Insects	—	10·64	41·27	17·30
Beneficial Insects...	—	1·15	·54	·56
Neutral Insects	52·50	42·30	23·63	39·48
Voles and Mice	—	8·96	14·18	7·71
Wild Birds	—	7·82	1·00	2·94
Game Birds	—	5·25	·09	1·78
Earthworms	47·50	7·43	5·91	20·28
Miscellaneous Animal Matter	—	·04	4·38	1·48
Total	100·00	100·00	100·00	100·00

If we add these food percentages to those previously obtained and take the average we find a general corroboration of the nature and quantities of the food even in a local investigation.

Comparison of the Food Percentages of two Investigations and Averages.

	Previous Investigation.	Present Investigation.	Average.
Seeds of Weeds	·55	·05	·30
Miscellaneous Vegetable Matter	5·96	8·38	7·17
Slugs or Snails	·02	·04	·03
Injurious Insects	30·62	17·30	23·96
Beneficial Insects	·99	·56	·77
Neutral	17·63	39·48	28·56
Voles and Mice...	31·05	7·71	19·38
Wild Birds	4·45	2·94	3·70
Game Birds	·51	1·78	1·14
Earthworms	7·83	20·28	14·05
Miscellaneous Animal Matter ...	·39	1·48	·94
Total	100·00	100·00	100·00

Summary and Conclusion.—The results obtained by this further investigation of the stomach contents of 98 birds taken in a local area where game birds are very generally reared, shows that the bulk of this bird's food during June and July consists of neutral and injurious insects, voles and mice, and earthworms. In comparison with other food items the amount of game birds is infinitesimal.

As has been previously stated the writer does not contend that the Little Owl does not destroy young game birds—it is well known that it does—but the actual percentage of this kind of food is so small, that, under ordinary circumstances, it is negligible. On the other hand it must be borne in mind that the bulk of its food is of such a nature that it must be regarded as of great value to the agriculturist. If we were to reverse these figures, viz., 17.30 per cent. of injurious insects, 7.71 per cent. of voles and mice, and 1.78 per cent. of game birds so that they were 25.01 per cent. of game birds and 1.78 of injurious insects, then there might be cause for alarm, for it would prove that the Little Owl was not an insect feeder or a destroyer of voles and mice, but that the bulk of its food consisted of game and other birds, but this cannot be stated even for the months of June and July, and during the remainder of the year the nature of the food is such that no unprejudiced mind can do other than admit that as a factor in the destruction of injurious insects and voles and mice, the Little Owl is a most valuable ally.

In conclusion, the writer wishes to express sincere thanks to Mr. M. Portal for the trouble, time and expense he has taken, and also to the various land-owners and their keepers for their kindness in forwarding specimens.

* * * * * *

NOTES ON MANURES FOR NOVEMBER.

SIR JOHN RUSSELL, D.Sc., F.R.S.,
Rothamsted Experimental Station.

Does Good Farming Pay?—During the past three months many farmers must have asked themselves the question whether it is worth while to farm well. With prices fallen to the present level there must be many who wonder if it would not be better to cut down all expenditure and reduce all their outgoings to a

minimum. There is high authority for the dictum that high farming is no remedy for low prices. It was Lawes himself in 1879 (a time when as at present farmers were faced with a crisis and when land was going down to grass, labour was being reduced and the standard of farming was falling) who impressed upon farmers the fact that large dressings of manures do not necessarily bring in high profits. To enforce this point he quoted the results of some of the experiments on the growth of wheat on Broadbalk field, Rothamsted. Four plots were set out and dressed with artificials, the dressings being as follows:—

	Average per acre per annum.	
	Dressed corn. Bushels.	*Straw.* Cwt.
Wheat every year, 27 years, 1852-78.		
Complex mineral manure, alone	15¾ ...	13½
" " " and 200 lb. ammonium salts ...	24½ ...	22⅝
" " " " 400 lb. " " ...	33¼ ...	33⅝
" " " " 600 lb. " " ...	36¾ ...	40⅞
Barley every year, 6 years, 1852-57.		
Superphosphate alone	31⅝ ...	16½
" and 200 lb. ammonium salts	45½ ...	28⅜
" " 400 lb. " "	49⅝ ...	34

The complex mineral manure consisted of 3½ cwt. superphosphate, 200 lb. sulphate of potash, 100 lb. sulphate of soda and 100 lb. sulphate of magnesia per acre, or just over 7 cwt. in all. The results showed that the 2 cwt. sulphate of ammonia in addition to other artificials gave an increased yield of 8¾ bushels per acre, while 4 cwt. sulphate of ammonia gave an increased yield of 17½ bushels, but 6 cwt. gave an increase of only 21 bushels.

From these figures it is evident that an increase in the total artificials from 11 cwt. to 13 cwt. per acre increased the yield of grain only by 3½ bushels per acre, and was therefore clearly unprofitable. Lawes concludes: "Assuming that the application of 400 lb. of ammonia-salts was the limit of high farming with wheat at 6s. per bushel I cannot see how it could be maintained that a further 200 lb., yielding little more than a third as much increase as when used in more moderate quantity, should be employed because the price of wheat was reduced to 5s. per bushel. On the contrary, the conclusion I should draw from the results of these experiments is that the application of the 600 lb. of ammonia-salts could only be profitable if the price of wheat were to rise instead of fall." Everyone would agree with this.

If any farmer were giving his wheat crop 11 cwt. of artificials per acre, including 4 cwt. of sulphate of ammonia, we could

quite certainly advise him that he would gain nothing, and probably lose, by adding still another 2 cwt. of sulphate of ammonia, making 13 cwt. of artificials in all. So far as dressings of this size are concerned there is no reason at all to suppose that they are profitable.

No farmer nowadays, however, uses anything like these quantities of artificials on wheat, not even the 4 cwt. of sulphate of ammonia which Lawes spoke of as the possible limit, and therefore the results are not directly applicable to modern practice. The experiment tells us nothing at all about the behaviour of the wheat crop with smaller dressings such as 1 cwt. or 1½ cwt. of nitrate of soda or sulphate of ammonia with or without 1 to 2 cwt. of superphosphate. Is it worth while using these? It is obviously very unsafe to say that because it does not pay to give 13 cwt. of artificials to wheat, therefore it does not pay to give 1 or 2 cwt. The experiment, in other words, cannot properly be quoted in relation to the modern problem. A more applicable experiment is now in hand at Rothamsted, and while the results are not all available those to hand suggest that the old conclusion does not apply to dressings of the size ordinarily given by farmers. There are also recent experiments on other crops that do not agree with this old conclusion. At the Midland Agricultural College an interesting experiment was made on Arran Chief potatoes in 1921. The whole field received 12 tons of farmyard manure per acre, but the various plots received different quantities of a mixture of artificials (3 cwt. superphosphate, 1 cwt. sulphate of ammonia and 1 cwt. sulphate of potash). The results were as follows :—

Plot	*Manuring.*		*Yield in tons per acre.*	*Percentage Ware.*	*Percentage Seed.*	*Value of Crop at £ per ton, Seed and Chats £2 per ton.*	*Cost of extra Manure at 4/- cwt. for Superphosphate, 16/- cwt. Sulph. Amm., 15/- cwt. Sulphate of Potash.*	*Profit or loss from additional Dressing.*
	Dung	*Artificials*				£ s. d.	£ s. d.	£ s. d.
1	12 tons	6 cwt.	11·31	53·1	42·3	46 13 0	—	—
2	12 „	8 „	13·63	56·9	39·3	58 5 0	0 17 0	+10 15 0
3	12 „	10 „	14·36	60·6	35·7	63 10 0	1 14 0	+15 3 0
4	12 „	12 „	13·19	61·7	38·2	58 18 0	2 11 0	+ 9 14 0
5	12 „	14	13·18	52·9	1·2	54 5 0	3 8 0	+ 4 4 0
6	12 „	16 „	11·34	58·4	38·3	49 3 0	4 5 0	− 1 15 0

Now it is quite obvious that the heaviest dressing (16 cwt. artificials per acre in addition to 12 tons farmyard manure) has not paid: nor has 14 cwt. paid as well as 12 cwt.; but it would be quite wrong to argue that therefore a farmer should not use artificials at all. As a matter of fact the highest profit is obtained not by the lowest dressing but by the 10 cwt. of artificials in addition to the dung. A similar result is obtained if the potatoes are written at half the cost. The true conclusion is that if it pays to grow a crop at all it pays to grow a good one, and a farmer should endeavour to find out what is the most advantageous quantity of fertiliser to use: he will not want to give too much, but he may lose if he gives too little. No one can say beforehand exactly what this quantity is, and nothing but experiment will show it; but an expert with local knowledge can give useful help.

Grass Land.—In time of financial trouble farmers look to grass to tide them over their difficulties and undoubtedly this is a safe plan. If, however, grass is to give all the help it can it must be properly treated. Fortunately this is not necessarily a costly matter, and poor grass can commonly be improved at a relatively small expenditure. Grazing land requires first and foremost good stocking. Professor Gilchrist has obtained striking results from mixed grazing at Cockle Park, the gain in live weight of the animals per acre being about doubled when sheep and cattle were used instead of sheep alone. He states "sheep graze only the fine bottom herbage and reject that of a stemmy character, whereas cattle graze much more evenly and not so closely. When a pasture is grazed with horses large areas soon become coarse and benty where their droppings are deposited and very bare on the parts where they graze. It is of the greatest importance that a pasture should be grazed closely at least once a year."

Assuming good grazing, considerable further improvement may be obtained by the use of basic slag or mineral phosphates. So much has been written about basic slag that it might seem superfluous to say more were it not for the fact that one can still find grass land that obviously needs it. Experiments have not shown that one kind of slag is invariably better than another, but there are a number of cases where high soluble slag has acted better than one of low solubility. Numerous experiments are being made in the various counties and the results should before long be available. Farmers are, however, becoming increasingly interested in mineral phosphates owing to their relative cheap-

ness. The following table has been drawn up by Professor Gilchrist*:—

COMPARATIVE COSTS OF SOME PHOSPHATIC MANURES IN THE SPRING OF 1922.

Manure.	*Phosphate.* %	*Price per ton†.* s. d.	*Price per unit.* s. d.	19 *units per acre in.‡* cwt.	*Cost per acre.* s. d.
Basic slag	38	101 0	2 8	10	50 8
Basic slag	22	62 6	2 9	$17\frac{3}{11}$	52 3
Ground American phosphate ...	70	125 0	1 9	$5\frac{3}{7}$	33 3
Ground African phosphate ...	60	115 0	1 11	$6\frac{1}{3}$	36 5
Superphosphate (soluble) ...	30	95 0	3 2	$12\frac{1}{3}$	60 2

Slags and mineral phosphates are both guaranteed to be 80 per cent. fineness (*i.e.*, passing sieve with 100 meshes to the linear inch). Satisfactory results have been obtained by Professor Gilchrist with some of the mineral phosphates especially when very finely ground (80 per cent. passing a sieve with 120 meshes to the linear inch). In one case the result appeared to be as good as, if not better than, that produced by high grade basic slag. With less fine grinding the results are less satisfactory.

The question often arises whether lime is needed in addition to basic slag. In many cases it is not, but the rule is by no means absolute. Dr. J. A. Hanley has found soils in Yorkshire which are so sour that basic slag does not act until lime is added, but then a remarkable effect is produced. Probably other soils of the same character could be found; where basic slag has not given the effect which might have been expected it is worth while consulting the county organiser with the view of having the soil examined.

* * * * * *

NOTES ON FEEDINC STUFFS FOR NOVEMBER.

E. T. HALNAN, M.A., Dip. Agric. (Cantab.),
Ministry of Agriculture and Fisheries.

The Use of Home-Grown Feeding Stuffs for Stock Feeding.—The prices of home-grown feeding stuffs, usually sold off the farm, have now reached the stage when it becomes more economical for the farmer to feed his grain crops to stock rather than to sell them for human food and purchase cakes

* Field experiments with Rock Phosphates and Basic Slag were described in this *Journal* for September and October, 1922, and a further article appears in this issue, p. 706.

† Carriage paid to farmers' stations.

‡ Containing nearly 200 lb. phosphoric acid.

and other foods for winter feeding. Notes have already appeared in a previous issue of this *Journal* (September, 1922, p. 562) on the use and method of feeding potatoes to stock. Several farmers have inquired about the chief points to consider in feeding grain crops, such as wheat, rye and barley. All farmers are sufficiently familiar with the value and use of oats to warrant not dealing with them in these notes, but it is evident that barley, rye and wheat are somewhat unfamiliar feeding stuffs from a stock feeder's standpoint. One of the first points to note about grain crops is the fact that they are all somewhat starchy foods, deficient in digestible protein. The nutritive ratio of barley is 1 : 10, and that of rye and wheat 1 : 7. Most farm rations for stock vary from 1 : 4 to 1 : 6, 1 : 6 being the most common ratio. It becomes necessary therefore, in feeding barley, rye or wheat to give in addition some nitrogenous supplement, such as fish or meat meal, earthnut cake or decorticated cotton cake.

A possible alternative method of supplying this protein deficiency is to feed legume hay, such as tare or oat hay, or clover hay as the bulky part of the ration.

One of the chief difficulties met with in feeding grain crops is to know how best to use them. Wheat is generally so hard that digestive troubles will occur unless it is cracked or broken. On the other hand, if it is too finely ground, the meal forms a pasty mass in the mouth and the stock find it almost a physical impossibility to eat it. Wheat should always therefore be fed in a cracked or broken state and should preferably first be soaked.

For pig feeding, barley, wheat and rye are best fed in the form of a coarse meal, soaked at least 12 hours before feeding.

For horses, both wheat and barley can be used in part replacement of oats. Barley may be fed whole, but wheat should be cracked. Rye can also be used for horses, and should be well soaked before feeding. The writer is aware of a farmer whose usual practice is to feed rye alone, well soaked, and his horses are kept in very good condition. Clover and vetch hay form the bulky part of the ration and the horses are fed on green vetches without any concentrated food throughout the summer.

With cows and bullocks, wheat and barley may form from one-third to one-half of the concentrated feeding stuffs given in the ration. The recommendations given above for horses apply equally to milch cows.

DESCRIPTION.	Price per Qr. s.	lb.	Price per Ton. £ s.	Manurial Value per Ton. £ s.	Cost of Food Value per Ton. £ s.	Starch Equiv. per 100 lb.	Price per Unit, Starch Equiv. s.	Price per lb. Starch Equiv. d.
Wheat, British	42/–	504	9 7	0 17	8 10	71·6	2/4	1·25
Barley, British Feeding	34/–	400	9 10	0 16	8 14	71	2/5	1·29
,, Canadian No. 3 Western	36/–	400	10 2	0 16	9 6	71	2/7	1·38
Oats, English White	29/6	336	9 17	0 18	8 19	59·5	3/0	1·61
,, ,, Black & Grey	26/6	336	8 17	0 18	7 19	59·5	2/8	1·43
,, Chilian	28/6	320	9 19	0 18	9 1	59·5	3/1	1·65
,, Canadian No. 3	31/6	320	11 0	0 18	10 2	59·5	3/5	1·83
,, ,, No. 2 Feed	28/9	320	10 1	0 18	9 3	59·5	3/1	1·65
,, American	28/3	320	9 18	0 18	9 0	59·5	3/0	1·61
,, Argentine	29/–	320	10 3	0 18	9 5	59·5	3/2	1·70
Maize, Argentine	41/9	480	9 15	0 15	9 0	81	2/3	1·20
,, American	37/6	480	8 15	0 15	8 0	81	2/0	1·07
,, South African	39/–	480	9 2	0 15	8 7	81	2/1	1·12
Beans, Rangoon	8/–	112	8 0	1 16	6 4	67	1/10	0·98
Millers' offals—								
Bran, British	—	—	6 0	1 13	4 7	45	1/11	1·03
Broad Bran	—	—	7 5	1 13	5 12	45	2/6	1·34
Fine middlings (Imported)	—	—	9 0	1 5	7 15	72	2/2	1·16
Coarse middlings (British)	—	—	8 5	1 5	7 0	64	2/2	1·16
Pollards (Imported)	—	—	6 15	1 10	5 5	60	1/9	0·94
Barley Meal	—	—	11 0	0 16	10 4	71	2/10	1·52
Maize ,,	—	—	9 15†	0 15	9 0	81	2/3	1·20
,, ,, S. African	—	—	9 10	0 15	8 15	81	2/2	1·16
,, Germ Meal	—	—	9 5	1 2	8 3	85·3	1/11	1·03
,, Gluten-feed	—	—	9 0	1 10	7 10	75·6	2/0	1·07
Locust Bean Meal	—	—	9 0	0 11	8 9	71·4	2/4	1·25
Bean Meal	—	—	13 10	1 16	11 14	67	3/6	1·87
Fish ,,	—	—	14 0	4 14	9 6	53	3/6	1·87
Linseed	—	—	19 10	1 15	17 15	119	3/0	1·61
,, Cake, English (9% oil)	—	—	12 10	2 5	10 5	74	2/9	1·47
Cottonseed ,, English (5% oil)	—	—	7 15	2 0	5 15	42	2/9	1·47
,, ,, Egyptian (5% oil)	—	—	7 10	2 0	5 10	42	2/7	1·38
Coconut Cake (6% oil)	—	—	9 0	1 16	7 4	73	2/0	1·07
Palm Kernel Cake (6% oil)	—	—	7 5†	1 6	5 19	75	1/7	0·85
,, ,, Meal (1½-2% oil)	—	—	5 15	1 7	4 8	71·3	1/3	0·67
Feeding Treacle	—	—	4 12	0 12	4 0	51	1/7	0·85
Brewers' grains, dried, ale	—	—	7 10	1 10	6 0	49	2/5	1·29
,, ,, ,, porter	—	—	7 0	1 10	5 10	49	2/3	1·20
,, ,, wet, ale	—	—	1 1	0 7	0 14	15	–/11	0·50
,, ,, wet, porter	—	—	0 15	0 7	0 8	15	–/6	0·27
Malt culms	—	—	8 10†	2 1	6 9	43	3/0	1·61

† At Liverpool.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of September and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative prices of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, suppose palm kernel cake is offered locally at £10 per ton. Its manurial value is £1 9s per ton. The food value per ton is therefore £8 11s. per ton. Dividing this figure by 75, the starch equivalent of palm kernel cake as given in the table, the cost per unit of starch equivalent is 2s. 8d. Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1·21d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own market.

In the case of young pigs, the chief point that arises is whether it is possible to do without middlings, which prove of such value to young pigs at the time of weaning. For such a purpose a mixture of oats and wheat, half and half, ground to a medium fine meal, might be used to replace middlings in the ration.

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THE following note has been communicated by Mr. J. L. Whytehead, one of the Ministry's Inspectors:—

Recent Advances in Poultry Keeping in Gloucestershire.

The County of Gloucester is rapidly improving its position as an egg producing district. The breeds of poultry kept are either the light breeds for egg production or the dual purpose breeds, and purely table breeds are rarely seen. The Ministry's Egg and Day Old Chick Distribution Scheme has been in operation in Gloucestershire for several seasons and has no doubt helped to show the advantages of keeping well bred stock. Under the scheme trap-nested stock of the utility breeds of hens and of ducks are obtainable by cottagers, small-holders and allotment holders.

Full advantage has been taken of the instruction in poultry keeping provided by the County Agricultural Education Committee. During the last two winters evening lectures in poultry keeping were given by the Poultry Instructor in widely scattered districts, the days being spent in visits of advice. Models of trap-nests, dry mash hoppers and drinking fountains, made from materials which were practically waste, were exhibited at every lecture and were often left behind to be copied by poultry keepers in the district. At the end of each lecture the names and addresses of those who wished to be visited were noted. It gradually became known that a whole-time poultry instructor was available, and the number of requests for advice, for lectures, and for judging at local shows rapidly increased. A stand is erected at the more important shows in the county showing specimens of good and bad types of laying hens, good and bad foods, appliances and samples of medicines, and visitors are invited to ask questions.

One result of the work done during the last two years is that about 5,000 more hens are being trap-nested than was the case previously. In many villages there are poultry keepers who can produce the records of eggs laid by their hens, and in some cases by their ducks. Many of these more advanced poultry keepers are reaping a good reward.

This autumn a laying test has been started for birds belonging to residents in the county of Gloucester only. The necessary funds are being obtained by subscription. The start is in a small way, but it is hoped that the standard will be high. Fifty pens have been arranged for pullets, and ducks are also being catered for.

The importance of poultry keeping by general farmers cannot be overlooked; indeed, some of the largest and most successful of the poultry farms in the county are the property of general farmers who have acquired an expert knowledge of poultry.

The large poultry farm has come more into evidence in recent years, and there are now about a dozen farms in Gloucestershire where more than 1,000 head of laying stock are kept, and a large number with from 500 to 1,000. There are eight Mammoth Incubators in use in the county, nearly all having been erected recently.

Two large egg-collecting depots are in existence at Cirencester and Nailsworth. At the former over one and a quarter million eggs were handled in 1921. The commercial egg farmer who sends his eggs direct to the large markets in many cases dispatches the consignments by goods train and this practice is increasing. It is found that there are fewer breakages than when sent by passenger train and the cost is much less.

Gloucestershire is an important fruit growing county and for this reason alone should carry a large stock of poultry. These two branches of farming go very well together. Mr. P. M. Hinton has kept poultry in some of his orchards near Tewkesbury for over 12 years with noticeably good results. The apple trees in these orchards have borne good crops for each of the past four years, including the years 1919 and 1920, which were generally bad apple years in this district. The growth of new wood has been very strong and it has been noticed that the young fruit trees on the land under poultry have matured more quickly than similar trees on adjoining ground not under poultry.

The keeping of a large number of birds on these orchards has enabled the owner to maintain the trees in first rate condition, and a very substantial saving of money has been effected in the purchase of manures. A reduction in expenditure on spraying has been possible owing to the destruction of fruit pests by the birds. For example, the Apple Blossom Weevil is becoming less in evidence each year in those orchards which are stocked with poultry.

* * * * * *



Photo

FIG. 1.—The Egg Depôt at Cirencester.

Lewis, Cirencester.



FIG. 2.—A large Laying-House for White Leghorns on a Farm in Gloucestershire.

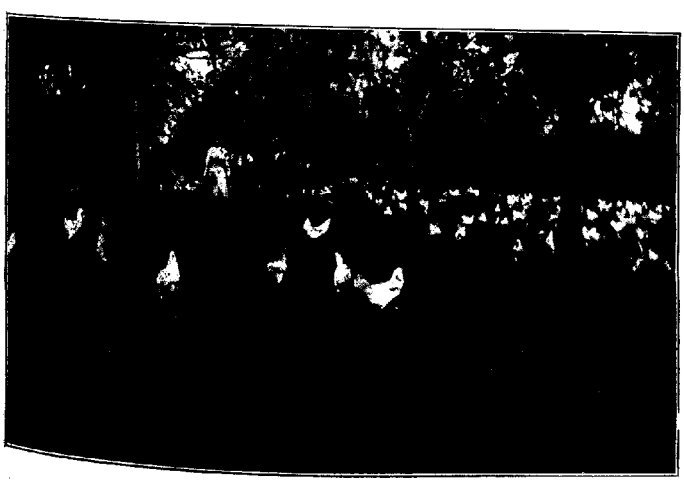


FIG. 3.—Orchard at Tewkesbury stocked with Poultry.

National Rat Week, 1922.

THE week commencing on Monday, 6th November, 1922, has been fixed by the Ministry as "Rat Week." A memorandum containing suggestions as to the action that may be taken by them and by the public has been issued to all Local Authorities in England responsible for the administration of the Rats and Mice (Destruction) Act, 1919, and it is hoped that all agriculturists will co-operate in securing the greatest possible destruction of these vermin at the time when they are returning to their winter quarters. Although an effort of this kind during one week is not sufficient to keep down rats and mice, but is only a feature in the continuous campaign which a number of local authorities are actively carrying on, it should produce good results not only by the destruction of a large number of rats, but by calling attention to the enormous waste of foodstuffs caused by their depredations, and by reminding the public that it is the duty of all occupiers to destroy rats and mice upon their premises.

The following are some simple suggestions for rat destruction:

Prevention being better than cure, begin by rendering rat-proof as far as possible all ricks, barns and granaries. In urban districts see that drains are intact.

To destroy rats proceed as follows:—

(i) Provided the Local Authority has appointed an officer under the Act, consult him, and, if he is authorised, entrust the destruction to him.

(ii) If you prefer to undertake the destruction yourself, consult a local chemist, asking for poisons containing Red Squill or Barium Carbonate. If there is absolutely no danger to domestic animals or human beings, one of the standardised phosphorus preparations is effective.

(iii) If you wish to make your own bait, the following recipes will be found effective:—

(*a*)

Barium Carbonate (Commercial)	6 oz.
Meal	16 oz.
Dripping	4 oz.
Salt	½ oz.

This will make 1,000 baits of 6 grains each, *i.e.*, pieces as large as a hazel nut.

(*b*)

Barium Carbonate (Commercial)	4 oz.
Biscuit or Oat Meal	4 oz.
Oil of Aniseed	5 drops

Mix with fat to a paste and lay out in pieces the size of a hazel nut in places where rats frequent.

(*c*)

	per cent.
Barium Carbonate (Commercial)	20
Fine Castor Sugar	40
Fine Meal	40

Thoroughly mix the ingredients. A bait is one dessert spoonfull wrapped in a twist of tissue paper.

(*d*)

	per cent.
Squill (Red Powder)	20
Bread	30
Fat	30
Syrup	20
Aniseed...	6 drops

Crumble bread. Mix ingredients to paste and apply as in (*a*) and (*b*).

Note.—Reasonable care should be taken when using Barium Carbonate bait to prevent domestic animals or poultry obtaining access thereto.

Gassing Rats.—Sulphur dioxide, applied from a Clayton machine or a cylinder, as well as carbon bi-sulphide properly applied, can be used to gas rats. Acetylene gas, generated by water dripping on calcium carbide, can also be used.

Traps.—"Six-inch" rabbit traps are more humane than the smaller ones generally used. Breakback traps properly set are good. Gins and snares catch many rats in a countryside.

Dogs and Ferrets are useful to clear an area after poisoning, and give good sport.

Mice.—The poisoned baits for destroying rats will also kill mice, but the bait should be smaller. Traps are used with greater effect to catch mice than rats. Keep pantries and food stores under proper supervision and see that the food of birds in cages cannot be got at by mice.

* * * * * *

A Modern Method of Rat Destruction.

SINCE the introduction of the Rats and Mice (Destruction) Act, 1919, the Ministry of Agriculture, County Councils, and other local governing bodies have adopted various means to fight the rat menace of the country.

The most recent and efficacious method is the use of sulphur dioxide gas. The gas is generated within a cylindrical vessel by burning sulphur and the sulphur dioxide is forced, by means of a fan, to the rat runs through a flexible metallic tubing at high pressure. Within four or five minutes the rats are suffocated, provided that care has been taken to block the exits to prevent bolting. It is well to have two or three well-trained dogs stationed near by to kill rats which may bolt from holes overlooked.

The bucks are generally the first to bolt. Does which have a litter will remain with their young to the end. A rat that bolts after the first minute or so of gassing is usually partly overcome and is an easy prey for the dogs.

By excavation of a portion of the area thus treated, sufficient evidence of the efficiency of this method may be obtained; also a point worth mentioning is the fact that other rats will be reluctant to establish themselves in the same place.

In this manner large rat-infested areas may be thoroughly and expeditiously treated. It is applicable on estates, farms, hedgerows, railway embankments and buildings of all kinds.

It is, however, only by active and determined co-operation between occupiers of rat-infested zones and the administrative authorities that the rat danger in this country will be controlled and will eventually be brought down to a minimum.

* * * * * *

THE following note has been communicated by Mr. N. B. Bagenal, until recently one of the Ministry's Inspectors:—

Hereford Fruit Market: Sale of Guaranteed Lots by Sample.

An interesting experiment in methods of marketing is being carried out this season by the Hereford Fruit Market, which for many years has been controlled by the Corporation of that City. The bulk of the fruit is marketed in wicker pot-baskets manufactured by the Corporation from osiers grown on the Town Sewage Works, and hired out to the vendors at 2d. per week.

During last season, considerable difficulty was experienced at the weekly sales, owing to the number of lots being too large for displaying in rows under shelter. To meet this difficulty, arrangements have this year been made to supply with the pot-basket a withy cover, not attached to the pot, but easily attachable. Fruit so packed is stacked on arrival, and one pot from each lot is exposed as a sample. By stacking, it is found possible to accommodate at least twice as many packages under cover as it was when all were exposed.

To allow of sale by sample, an official label is issued to all vendors who use the withy cover. To each pot marketed under this system, is attached one of these labels bearing a guarantee of variety, grade, and net weight of fruit, filled in and signed by the grower, and giving his address. To meet the demands of growers for non-returnable packages, the Market Authorities supply the British Federation Standard Box (40 lb.) made up, or in the flat. These are sold to the vendor at a trifle over cost price, and a charge of 5d. is made to the purchaser. It is proposed to hold three special box sales during the course of the season.

The Market Authorities retain responsibility for all purchased lots, until they are delivered, ready packed, to the local representatives of the various railways, whose vans come to the market during and after the sale to collect the fruit. In this way the purchasers are spared all trouble with regard to the packing and despatch of their fruit from the market, and to those who come from a distance this is a distinct advantage.

It is to be noted that the Market Authorities have not attempted to enforce the system of sale by sample to the exclusion of the former method. Fruit is still sold in pots without covers or in any reasonable form of package; but when the withy cover is used in conjunction with the pot-basket, then the guarantee label must be used also.

While it must be admitted that the prices obtained for lots sold by sample have not, so far, proved highly satisfactory, it should be remembered that the system is new to the district, and that purchasers are necessarily cautious with any new system until it has been thoroughly tried and has passed the test.

The first object of the change, namely, economy of space under shelter, has been attained, and on a wet market day the advantage thus offered to those whose packages are under cover, is particularly noticeable. It is, moreover, generally conceded by the purchaser that pot-fruit provided with withy covers travels better, and with less risk of pilferage, than when packed in the old way.

Growers who have used the guarantee label under the new system have loyally upheld the good traditions of the market, and the Authorities have had practically no complaints from the purchasers on the score of topping. This being so, there can be little doubt that the Hereford Corporation are on sound lines in their new undertaking, and if the market slogan of "Good Fruit, Fairly and Honestly Packed and Correct to Weight" is generally adopted throughout the district, there is every hope that this enterprising project will meet with all the success it deserves.

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Gulval Fruit Plot.

SITUATED on the hills at the back of Penzance there is a small plot of land—just two acres in extent—which is known as the Gulval Fruit Plot. It has been used by the Education Committee of the Cornwall County Council for experimental purposes since 1898. In the first instance, one half was planted with fruit and served to demonstrate that apples and pears could be raised in the Penzance district of sufficiently good quality to realise top prices in the London markets; the other half was used for asparagus and vegetable production on French gardening lines.

The growers in the district (Gulval, Marazion, etc.,) are, however, not as interested in fruit growing as in the culture of early potatoes and broccoli, which must be regarded as the principal crops of the Penzance area. The Cornish grower, who is unable to produce his potatoes as early as the grower in the Channel Islands and Isles of Scilly, aims at raising a crop by the second week in May, and in normal years these are the first home-grown potatoes in the market. Earliness is the main factor, and only a few varieties such as Duke of York, May Queen, Sharpe's Express and Advance have proved of much

value. Experiments conducted at Gulval to test (*a*) the capacity of all the early varieties, and (*b*) the effect of sprouting the tubers in boxes, should provide valuable new information to those Cornish growers who have too long followed the same system.

The Penzance area, in virtue of its temperate winter climate, is able to mature broccoli in mid-winter when growth in other districts has been almost stopped. Yet the district has its defects—the winds are strong and bring with them salt sea sprays which coat the plants, and only a few varieties, it is stated, can withstand this treatment. For very many years the variety of broccoli chiefly grown has been the Penzance Early —a good, hardy, heavy-cropping variety with coarse heads of a yellowish colour. This is not an ideal variety and experiments are needed to discover a suitable broccoli possessing a smoother curd and better colour and more suited to present markets. It is understood that provision has been made at the Gulval plot for trials during 1922 of a large number of varieties of broccoli. Such experiments should be watched closely by the Cornish growers and by broccoli growers in general.

* * * * * *

Yorkshire Fruit Demonstration Station.

THE increasing population in the industrial parts of the north of England has created a large demand for fresh fruits and vegetables, which in the past has been met by supplies from the south of England and from overseas. In recent years there has been more planting of fruit on a small scale around Hull and York, and the area devoted to vegetables at Selby has possibly increased, but in the main little effort has been made by growers in Yorkshire to change their methods of farming by substituting fruit and vegetables for grass, cereals or roots. Culture of this character, which is of an intensive nature, requiring skill and detailed attention, could be undertaken by many of the small holders recently settled in those parts of Yorkshire where the soil is suitable.

The Yorkshire Council for Agricultural Education, to encourage this movement, has decided to establish a few demonstration centres throughout the county, the first having been established at Osgodby in 1920. A plot of land of 4½ acres, originally intended for a small holding, has been given over for this purpose, on which there have been built a typical small holder's house, a shed for tools, packing shed and store-room complete. The land, which consists of a poor sandy soil, has been well cultivated and

fully planted to top and bush fruit. There is a general slope to the south, and a sheltered belt of standard trees of Hessle Pears, Merryweather and Farleigh Damsons, and John Downey Crab Apples has been planted. These prolific pollen-bearing trees should also assist in ensuring a good fertilisation of the quality fruit trees proper. The apples chiefly planted are Worcester Pearmain, King of the Pippins, Allington Pippin, Cox's Orange Pippin, for dessert, and Lane's Prince Albert, Newton Wonder, and Bramley Seedling for cooking purposes. Beurre Hardy, Pitmaston Duchess, and Williams are the chief varieties of pears, and Victoria, Czar, and Early Rivers the principal plums. All these trees are propagated on East Malling standardized stocks, and are interplanted with bush fruits of gooseberries and currants, between the rows of which there are grown various kinds of vegetables. The whole is a typical fruit-growing small holding.

The plot has only been established a short time, and it is impossible to predict the results, but it is certain that the plot will be of great use to all fruit growers in the county, by demonstrating the best stocks suitable for the propagation of fruit trees, and the best methods of culture, pruning and care of the trees in order to produce fruit of marketable quality. The station should afford a stimulus to small holders in the district to engage in these methods of cultivation.

* * * * * *

The following letter has been sent to all Local Education Authorities :—

6th October, 1922.

Sir,

Clean Milk Production.
Milk and Dairies (Amendment) Act, 1922.

I am directed by the Ministry of Agriculture and Fisheries to ask you to be good enough to bring to the special notice of the Local Education Authority for Agricultural Education the question of instruction in clean milk production, in view of the passing of the Milk and Dairies (Amendment) Act, 1922. As your Authority are aware, the Milk and Dairies (Consolidation) Act, 1915, was to have come into operation on 1st September, but in view of the heavy annual expenditure involved in its administration, and the state of agriculture at the present time, this larger measure has been postponed for a further three years. In the meantime the Milk and Dairies Amendment) Act reflects in a measure the growing public demand for cleaner milk.

2. The principal features of this new Act relating to the subject of clean milk are as follows:—(1) Local Authorities are empowered—subject to appeal—to refuse to register, or to remove from the register, any milk retailer if they are satisfied that such action is necessary in the interests of public

health. (2) As from 1st January, 1923, milk may not be sold as "Certified," "Grade A" or "Pasteurised" except in accordance with a licence granted by the Minister of Health or with his authority. The conditions under which licences will be issued will be laid down in an Order of the Minister of Health, which will provide for certain modifications of the system at present in operation for the issue of licences under the Milk Orders. (3) A heavy penalty is imposed upon any person who sells the milk of a cow suffering from tuberculosis of the udder where it is proved that he knew, or could have ascertained by ordinary care, that the cow was suffering from that disease.

3. Coupled with the public demand for cleaner milk, there is the economic fact that cleaner milk leads to greater consumption. In other words, it is in the best interests of dairy farmers to send out milk in a clean condition. In very many cases, however, the methods by which clean milk can be secured are too little realised by farmers, and can only be inculcated by systematic instruction and demonstration, which falls within the province of Local Education Authorities.

4. The Ministry realises that many Local Authorities are unwilling to incur substantial additional expenditure at the present time. Although, therefore, the provision of instruction designed to ensure clean milk is of such direct interest to ratepayers that expenditure thereon could be justified even at a time of financial stringency, the Ministry does not wish to press for new appointments of staff or for courses of lectures involving considerable expense. On the other hand, a good deal of valuable work can be done at very little cost, and it is from this point of view that the Ministry trusts that the subject will receive your Authority's earnest consideration. As examples, reference may be made to clean milk competitions and demonstrations.

5. The initiation of clean milk competitions amongst farmers is a movement of some promise. The awards are based on a bacteriological and chemical examination of the milk and an inspection of the equipment and methods in use at the farm. Diplomas are granted to competitors attaining a sufficiently high standard, and money prizes may be awarded to the milkers. Successful competitors have every right to expect, and in some instances have already obtained, a higher price for their milk, and the result of the efforts made by the others cannot but be beneficial, particularly as a concise report on his own conditions of production is sent to each competitor. Competitions of this sort have already been held with success in one or two counties, and are contemplated in others. A leaflet issued by the Bucks County Agricultural Committee on the subject of the competition held by that Authority is enclosed for your information. It will be seen that, apart from the cost of advertising and printing, the competition involved the Authority in very little expense, as the prizes were offered by manufacturers.

6. Demonstrations in clean milk production can be undertaken without considerable outlay, and afford a productive field for effort. The Ministry's technical advisers have recently given much thought to this question, and have prepared a memorandum for the guidance of Local Authorities thereon. A copy of this memorandum is enclosed, and if, after consideration, your Authority wish to proceed with demonstrations of this nature, copies of the plans referred to in the memorandum will be supplied by this Department at a small charge.

7. Several County Education Authorities have already caused their dairy instructresses to attend one of the special courses of instruction in clean milk production for teachers which have been conducted by the University College, Reading. The Ministry is arranging that the College shall repeat these courses, so that those teachers who have not at present had an opportunity to attend may do so.

8. I am also to enclose (1) a copy of a Memorandum on "How to Produce Clean Milk," which embodies the main points of an article on this subject which appeared in the Ministry's *Journal* in April last, (2) a copy of Leaflet No. 151, on "Cleanliness in the Dairy," which the Ministry would like to see distributed widely amongst dairy farmers. Further copies of this leaflet can be obtained from this Office at the rate of 4/- per hundred.

I am, &c.,
A. D. HALL.

* * * * * *

Foot-and-Mouth Disease.—There has been no development arising from the outbreak which occurred at Manchester on 24th August last, and the restrictions in that district have now been withdrawn.

On 20th October the existence of disease was confirmed among pigs on premises at Harmondsworth, near Yiewsley, Middlesex. The usual restrictions were imposed in respect of an area within a radius of approximately 15 miles of the infected premises. Owing to the nearness of this outbreak to the Royal Agricultural Hall, Islington, where the Dairy Show was in progress, and to the fact that some of the animals in the show had been brought from places within the prohibited area, the Ministry's veterinary inspectors made an examination of all animals at the show, and were satisfied that none of them showed signs of being affected with foot-and-mouth disease. As a precautionary measure, however, the Ministry prohibited the movement of any animal from the show except by licence of the Ministry. Licences were granted subject to the condition that the animals were detained and isolated for 10 days at the place of destination.

Licensing of Stallions under the Horse Breeding Act, 1918.—Stallion owners in England and Wales who intend to travel their horses next service season are reminded that applications for the necessary licences under the above-mentioned Act may be made as from 1st November. Forms of application can be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

It should be noted also that licences for the past travelling season only remain in force until 31st October, and in accordance with the provisions of the Act, should be returned forthwith to the Ministry. Failure to comply with this requirement renders an owner liable, on summary conviction, to a fine not exceeding £5.

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